lectrical World
SEPTEMBER 4 1943
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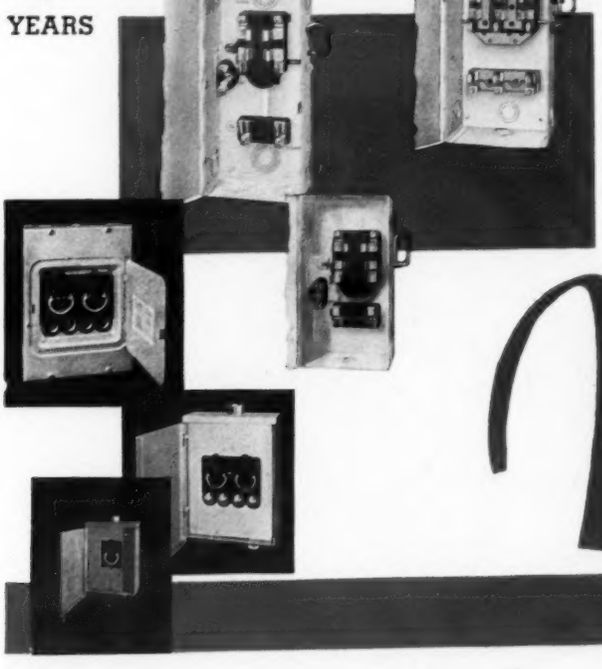
SOLDERLESS CONNECTORS THAT HOLD LIKE A VISE!

½" socket wrench for 3 larger sizes
Enormous pressure makes electrical contact absolute
Cable or wire can be inserted from any of 3 directions

FROM YOUR JOBBER — HE HAS THEM IN CONVENIENT, ECONOMY PACKAGES!

SOME FAMED MURRAY SWITCHES IN WHICH MURRAY SOLDERLESS CONNECTORS HAVE BEEN STANDARD FOR YEARS



So strong that they'll take all the tightening you will ever give them. When they're *tight*, they HOLD—and electrical contact is absolute. You can insert the cable or wire from any of *three* directions. These speedily-installed Murray Solderless Connectors have been standard in Murray Switches for years. Metropolitan Device Corporation, Brooklyn, N. Y.

SOLDERLESS CONNECTORS *by* Murray

METROPOLITAN DEVICE CORP. Brooklyn, N.Y.

Send price list and complete listing of Solderless Connectors

Name_____

Address_____

Electrical World

FOUNDED IN 1874 • READ BY ELECTRICAL MEN FOR 69 YEARS

September 4, 1943 — Vol. 120, No. 10

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To .....

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Signed .....

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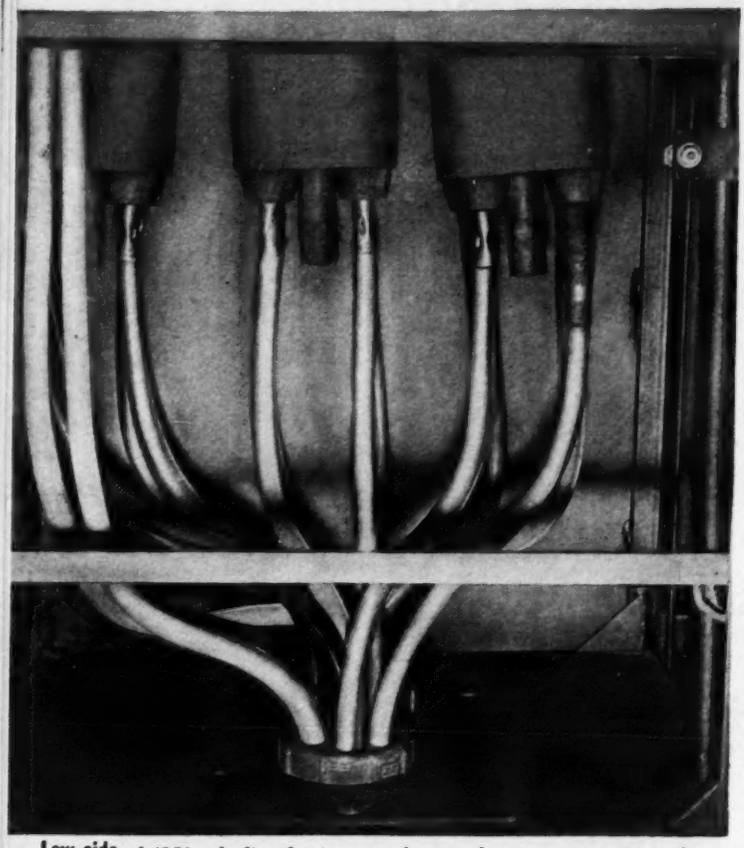
ENGINEERED TO LAST FOR 99 YEARS



Low side of 4150 volt distribution transformer showing connections of one of the three 208-volt ring mains, in the Bell Telephone Laboratory cellar. This is a 3-phase 208 volt 4-wire system with a pair of circuits passing through each "crab" joint (one phase per terminal). The 4/0 Awg Okolite-Okoprene cables are colored blue, red, and black for phase identification. The two white cables on the left are the neutral conductors. The cables are connected to the crab joint with mechanical squeeze connectors. One of the conductors is in the process of being terminated.

When Bell Telephone Laboratories decided to decentralize part of their engineering facilities by moving into the country, they determined that their new buildings would be built to last "for at least 99 years."

Taking advantage of their own extensive laboratory experience and test results, they wrote specifications that they knew would provide the most durable materials and equipment available.

Their wiring specifications, for instance, called for an oil-base compound protected with a neoprene sheath, where exposures required it. In this new laboratory it was essential to have insulated wire that would resist flame, moisture, heat and chemicals.

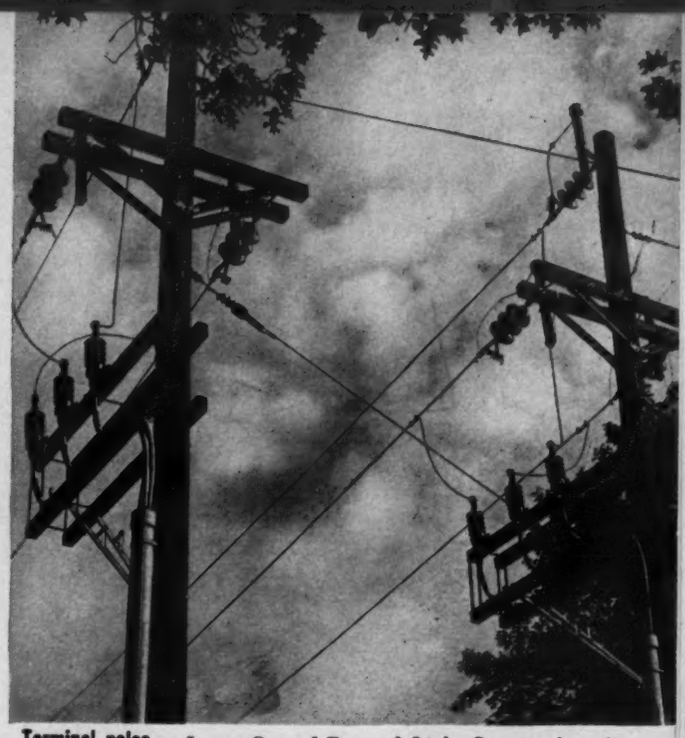
The accompanying illustrations show how Okolite-Okoprene cables fitted into the picture and how simple it was to install and splice this carefully-chosen wiring. Okolite-Okoprene cables are used in many other places — in central stations, on railroads, in industrial plants, mines, or wherever long-life and full protection is required and they cost no more than high quality-braided wire. Bulletin OK-2009 describes them in detail. . . . The Okonite Company, Passaic, N. J.

Cooperating on this project were:
Architects and Engineers:
Voorhees, Walker, Foley & Smith, New York
Electrical Contractor:
Hatzel & Buehler, Inc., New York City
Distribution and Power Cables:
The Okonite Company, Passaic, New Jersey

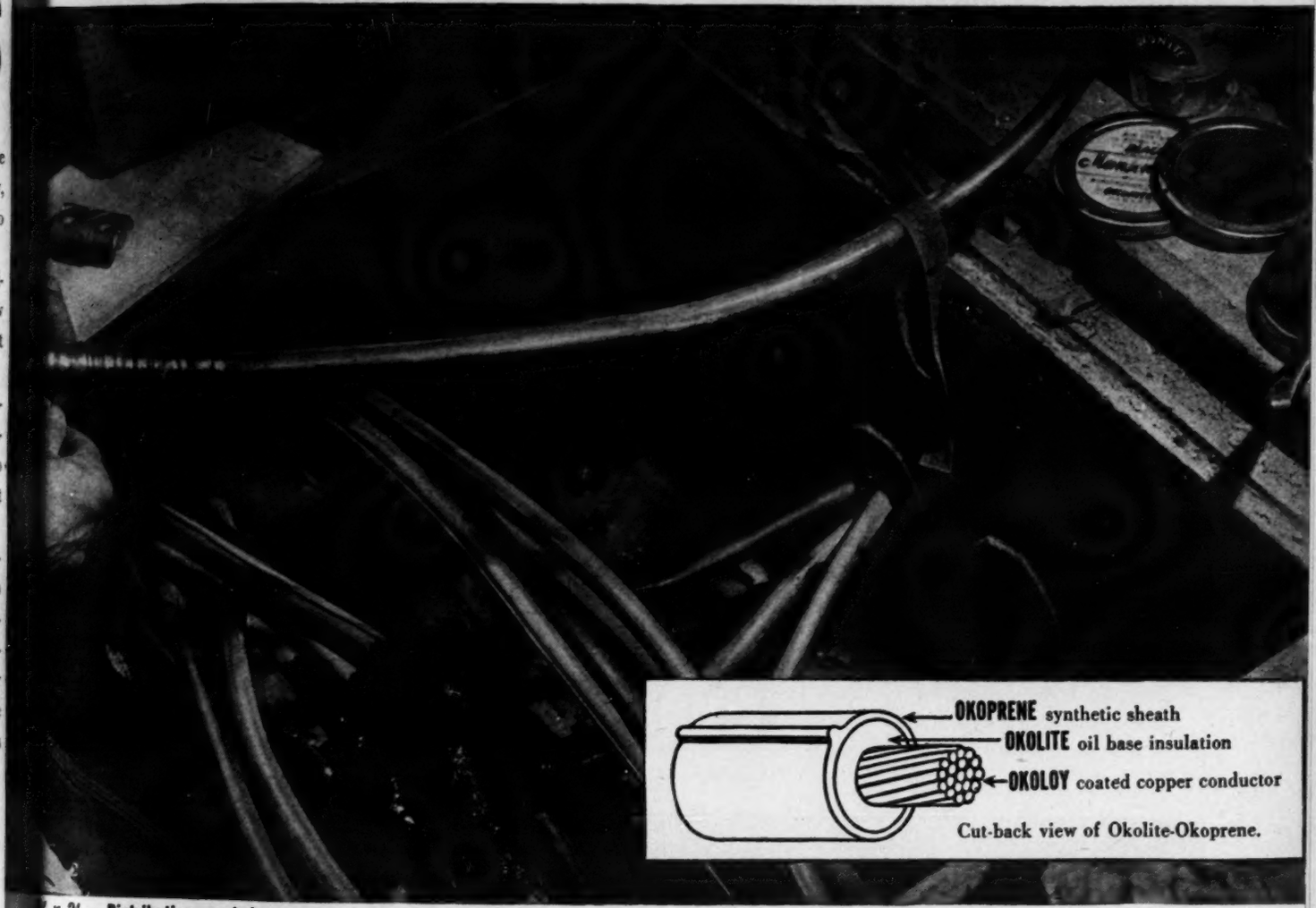
OKONITE

cal manhole in 4150 volt power distribution line running from substation ell Telephone Laboratories. 6 cables on right are 2 circuits of Okolite 3/0 11/64" Okolite 4150 volt lead-covered cables supplying power to distribu- transformers in laboratory. 2 cables on left are each 7-conductor Okolite- prene signal cables for operating signal light on control board in main ding to permit checking position of substation breakers.

3' x 3'—Distribution manhole and distribution panel in cellar of Bell Telephone Laboratory. 14 — 4/0 Okolite-Okoprene cables pass through each manhole — each phase and the neutral are tapped by means of a special split tee-connector. Tap circuit can be seen leaving manhole and entering 208-volt distribution panel. Manhole is carefully waterproofed and cover sealed with a gasket.



Terminal poles on Jersey Central Power & Light Company's main feeder line (13,200-volts) serving Bell Telephone Laboratories substation. 6-single conductor Okonite Varnished lead-covered pole riser cables run from pothead terminals through 4" conduit to substation main line breakers.



Cut-back view of Okolite-Okoprene.

' x 3'—Distribution manhole in Bell Telephone Laboratory cellar show- ng taps being made on 208-volt ring main distribution cables. These are /0 Okolite-Okoprene cables colored for phase-identification. Splicer is aking final tap with special split tee-connector. Exposed section of con- uctor and connector are insulated with Okonite rubber tape and pro- tected with layers of Manson Tape and finally painted with weatherproof compounds. Okolite-Okoprene cables were specified for use in the following tough, damp locations: (1) under cellar floors, (2) between buildings (3) to street lighting standards, (4) at substation, (5) all wiring in kitchen refrigerators, (6) all wiring to outdoor bracket fixtures.

AUGUST 25, 1943
W.P.B. Eases Utility Rules On Extensions
Eliminates Processing of Eight to Ten Thousand Applications a Month
From the Herald Tribune Bureau
WASHINGTON, Aug. 24.—The War Production Board eliminated today a vast amount of paper work by simplifying the system by
MATCH THIS EXTENSION SPEED-UP
WITH FAST-MOVING SUPPLY SERVICE
VIA.. GraybaR

Under the new WPB order U-1-F, you'll have a better chance to *move fast* in making essential extensions of service.

Prompt action in getting the jobs under way will depend more than ever on the availability of supplies. And that's where GRAYBAR—with its specialized knowledge of utility needs and practices—can put its fast-moving supply service to work in your behalf.

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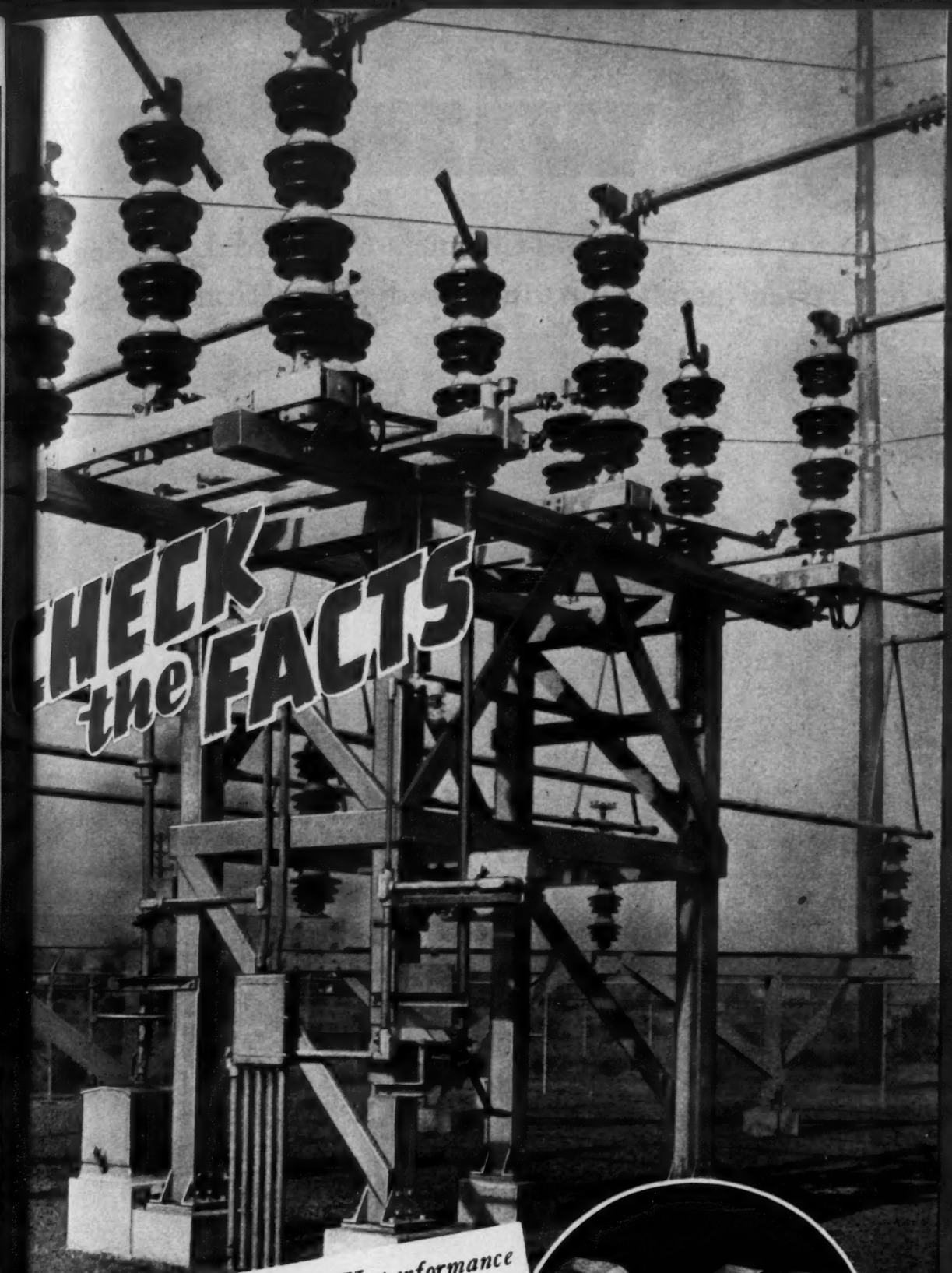

CHECK the FACTS

1. SATISFACTORY *performance*
2. STURDY *construction*
3. SAFE *operation*
4. SIMPLE *design*

R&IE

Type **"TTT"** MOTOR OPERATED SWITCHES

The Check List

- CONDUCTOR SUPPORTS CLAMPS AND FITTING
- DISCONNECTING SWITCHES INDOOR AND OUTDOOR
- AIR BREAK SWITCHES
- INTERRUPTER SWITCHES
- CUTOUTS AND THERMO-RUPTERS
- SWITCH OPERATING MECHANISMS
- SUBSTATIONS
- OPEN OR ENCLOSED ISOLATED PHASE HEAVY DUTY BUSES
- KIRK INTERLOCK SYSTEMS
- AUTOMATIC SECTIONALIZING EQUIPMENT
- METAL CUBICLES
- TESTING DEVICES

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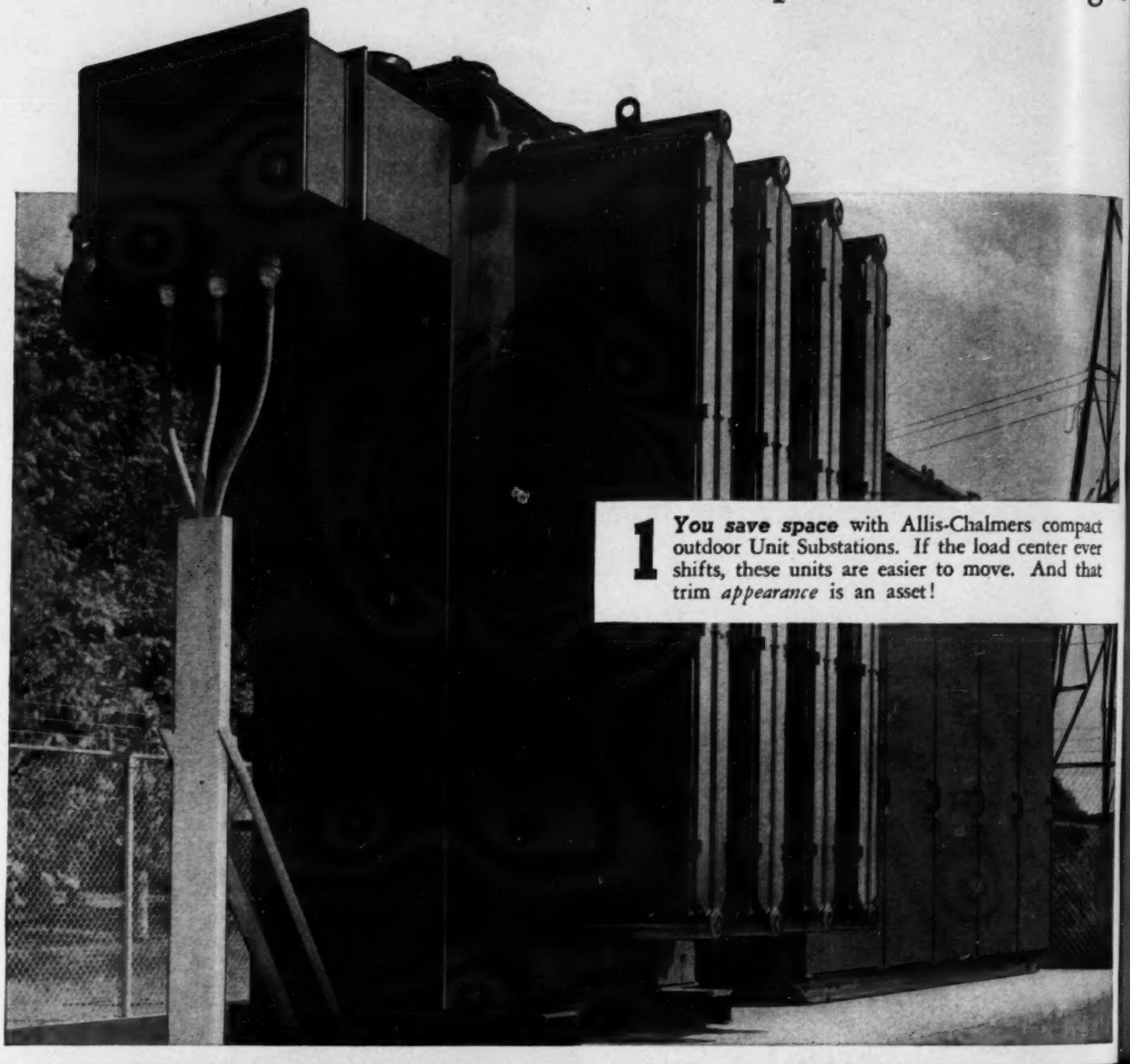
IN CANADA—EASTERN POWER DEVICES, LIMITED, TORONTO

Big Swing is

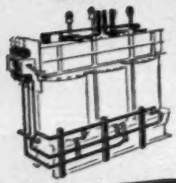
Modern, packaged Allis-Chalmers Standard-Load Center ies, faster installation, increased production. Packaged



1 ***You save space*** with Allis-Chalmers compact outdoor Unit Substations. If the load center ever shifts, these units are easier to move. And that trim *appearance* is an asset!

Check these features..

Sturdy Lead Supports



Rigid, braced supports hold leads securely in position during stresses caused by system short-circuits. Wide spacing of leads increases electrical strength.

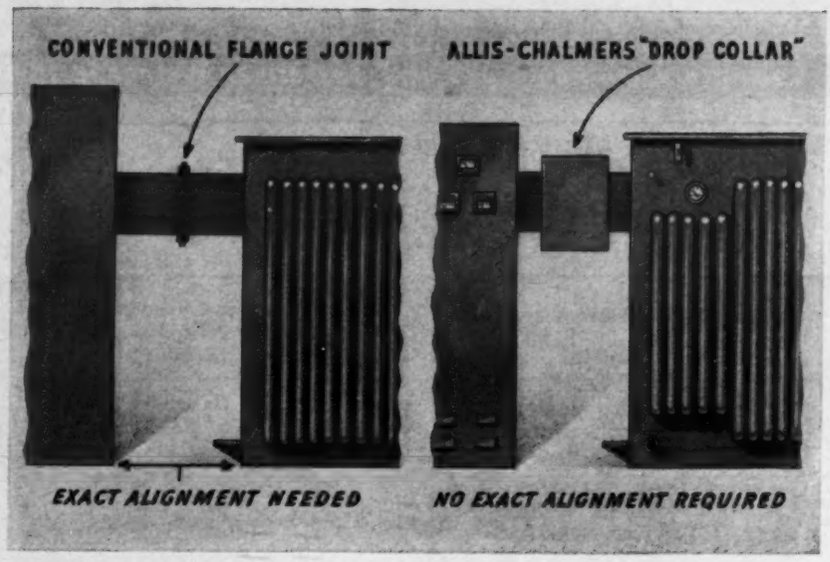
"Feather-Touch" Control

Large Unit Substations having load-ratio-control transformers are equipped with "Feather-Touch" Control . . . maintains voltage within narrow band widths.

to Packaging!

Unit Substations give you the advantages of shorter deliver-
power also saves floor space, improves motor performance.

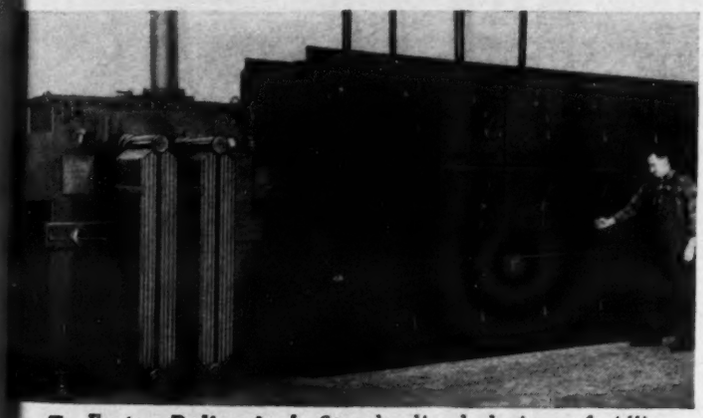
HIGH	LOW
1. DISCONNECT SWITCHES	1. STATIONARY AIR BREAKER
2. OIL FUSE CUTOUTS	2. DRAWOUT AIR BREAKER
3. METAL-CLAD SWITCHGEAR	(CAN BE ELECTRICALLY OR MANUALLY OPERATED)
4. DIRECT CONNECTION TO ROOF BUSHING	
5. LOAD BREAK SWITCH AND FUSE COMBINATIONS	



2 ***Flexibility!*** Note the wide variety of high and low voltage equipment. Transformers can be oil- or Chlorextol-filled or dry type!

3 ***Easier Installation!*** Allis-Chalmers "drop collar" on outdoor units and on high side of indoor units means no flanges to bolt, no need for exact alignment at base. Flexible cable low-voltage connection on indoor units also saves time.

A 1639



4 ***Faster Deliveries!*** Standardized design of Allis-Chalmers Load Center Unit Substations eliminates "specials" saving time on drafting board and in shops. Yet these units are completely adaptable to your needs!

WE WORK FOR VICTORY — WE PLAN FOR PEACE

ALLIS-CHALMERS
UNIT SUBSTATIONS

Get the full story on Load Center Unit Substations from the district office near you. Or write ALLIS-CHALMERS, MILWAUKEE 1, WIS.

nclosed Wiring Channels

Control wiring protected by built-in ducts . . . affords safe, efficient operation of units. Large channels allow room for additional secondary control wiring, if needed.

Jig-Built Switchgear

Allis-Chalmers switchgear is built in sturdy jigs to assure uniformity. Accurate manufacture means quick installation, correct alignment, more satisfactory operation.

Longer Gasket Life

Extended tank wall on transformers protects cork gaskets from overcompression when cover bolts are tightened. This construction insures a permanent seal.

New Ampac Wins 2 to 1!

You see big differences when you compare a-c welders today. In modern features assuring you easier operation, lower upkeep, faster and better welding . . . you'll find that Allis-Chalmers' revolutionary new Ampac "200" leads by 2 to 1!

Compare 4 leading types of Transformer Welder in their Use of 11 Important Features . . .

	IMPORTANT FEATURES	HOW THEY BENEFIT YOU	AMPAC "200" (Integrated moving core type)	WELDER "B" (Moving coil type)	WELDER "C" (Moving core type)	WELDER "D" (Shunt type, moving core)
1	No arc blow to slow down welding.	Steady arc makes sound, uniform welds. You can weld in corners and grooves easily. Production is speeded.	YES	YES	YES	YES
2	Low striking voltage at high amperage.	Saves power for you. No need for high voltage at high currents. Raises power factor — cuts power input.	YES (65 volts)	NO (75 volts)	NO (75 volts)	NO (75 volts)
3	High striking voltage at low amperage.	Strikes arc fast. Gives you high, yet safe voltage necessary. Makes a-c welding easy at low currents.	YES (78 volts)	NO (72 volts)	NO (75 volts)	NO (75 volts)
4	Takes less than 300 sq. in. floor space.	Small size saves valuable space on crowded shop floors . . . makes it easier for you to move and handle the unit.	YES (281 sq. in.)	NO (361 sq. in.)	NO (398 sq. in.)	YES (288 sq. in.)
5	Contains less than 5 wearing parts.	Cuts maintenance to simple lubrication twice a year. Less chance for wear means longer service, lower upkeep.	YES (4 parts)	NO (8 or more)	NO (6 or more)	NO (6 or more)
6	Low original cost (no rotating element).	Simpler construction of a-c welder cuts purchase price to around 65% of what you would pay for a d-c welder!	YES	YES	YES	YES
7	Wide welding range of over 200 amperes.	You can weld thin sheets . . . yet have capacity for heavy plates, too. You can use rods from 1/16" to 1/4" in size!	YES (220 amp)	YES (215 amp)	NO (195 amp)	NO (195 amp)
8	Reconnectable for 220-440 & 208 v., 60 cycle.	Gives you full capacity at low voltages where lines are long and isolated. Can be used on *any* standard a-c voltage!	YES	NO (220 or 440)	NO (220-440 only)	NO (220-440 only)
9	Over 85% efficiency at normal loads.	You enjoy *full* benefits of a-c welding: lower power loss, high power factor, lower operating costs!	YES	NO	YES	YES
10	All settings within six control turns.	Saves welding time. Welder can make simple adjustment from high to low amperage current quickly and easily.	YES (6 turns)	NO (50 turns)	NO (30 turns)	NO (15 turns)
11	Movement of variable part 2" or less.	Cuts wear and maintenance to a minimum. Reduces hum and vibration Contributes to trouble-free operation.	YES (1 inch)	NO (9 inches)	NO (6 inches)	YES (2 inches)
		Only Ampac gives you all 11 . . . TOTALS	**11** Ampac "200"	**3** Welder "B"	**3** Welder "C"	**5** Welder "D"

ALLIS-CHALMERS AMPAC "200"

WRITE ALLIS-CHALMERS, MILWAUKEE, WIS., FOR COMPLETE INFORMATION

1618

"It's JUST ONE insulator we're talking about"

From a strength standpoint, every string of suspension insulators, no matter how long, depends upon a single unit--the weakest one. It's a good thing to know a lot about that one unit.

Average strength values don't tell you *anything* about it. Averages admit variations. You must know the permissible limit of weakness allowed under such averages. Then you have the only true strength value of every unit in a system because you, or no one else, knows where the one weakest unit is located. One unit becomes mighty important.

2404-H

Instead of leaving it up to you to discover the minimum strength of your suspension insulators, either by a difficult investigation or "the hard way", you will find that minimum strength value cast permanently into the cap of every O-B unit. We're not afraid to tell you just what *is* the weakest unit. That's all we claim for any of them. Of course, most O-B units are stronger due to natural slight fluctuations that enter into any manufacturing process. That's just a "dividend" you get. But you *know* none are weaker. You can safely build engineering designs around O-B rated strength figures.

O-B's manufacturing ability to reproduce a certain design accurately countless times made it possible for us to pioneer in the principle of rating suspension insulators on the basis of strength of the minimum unit. O-B gives you the kind of strength that *counts*, because you can *count* on it!

Ohio Brass

MANSFIELD, OHIO

CANADIAN OHIO BRASS CO., LTD., NIAGARA FALLS, ONTARIO

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The heart of the vibrating reed instrument for measuring speed, frequency or rate of vibration is *the reed itself.* The very simplicity of this vibrating reed belies the technique which is required to make it. The successful production of hundreds of thousands of these accurately tuned reeds requires a high order of craftsmanship and experience and is the basis of our success in building Frahm Tachometers and Frequency Meters for more than 25 years.

First, the proper alloy must be selected, graded, polished, and cut to size. The ends are softened, bent, loaded, painted for visibility, and properly coated for protection. The reeds must then be mounted in "shoes" and meticulously *tuned,* after which they are specially "aged" and assembled for final adjustment and calibration. Consequently Frahm Reeds can be depended upon to hold their calibration under even the most difficult service conditions.

Every Frahm instrument that leaves our factory is of known high quality . . . backed by our years of experience.

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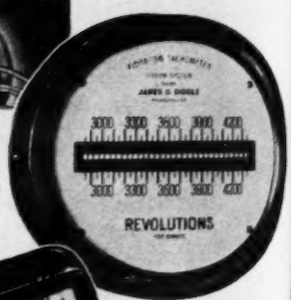
Frahm Tachometers and Frequency Meters are made in both hand and permanent mounting types for speeds or rates of vibration in various ranges between 900 and 30,000 per minute, or frequencies from 15 to 500 cycles per second. Bulletins descriptive of the several types are available on request: Frahm Tachometers, Bulletin 1590-W; Frahm Frequency Meters, Bulletin 1695-W.

◀ MINIATURE FREQUENCY METER

PORTABLE FREQUENCY METER ▶

▲ HAND TACHOMETER

PERMANENT MOUNT TACHOMETER ▶



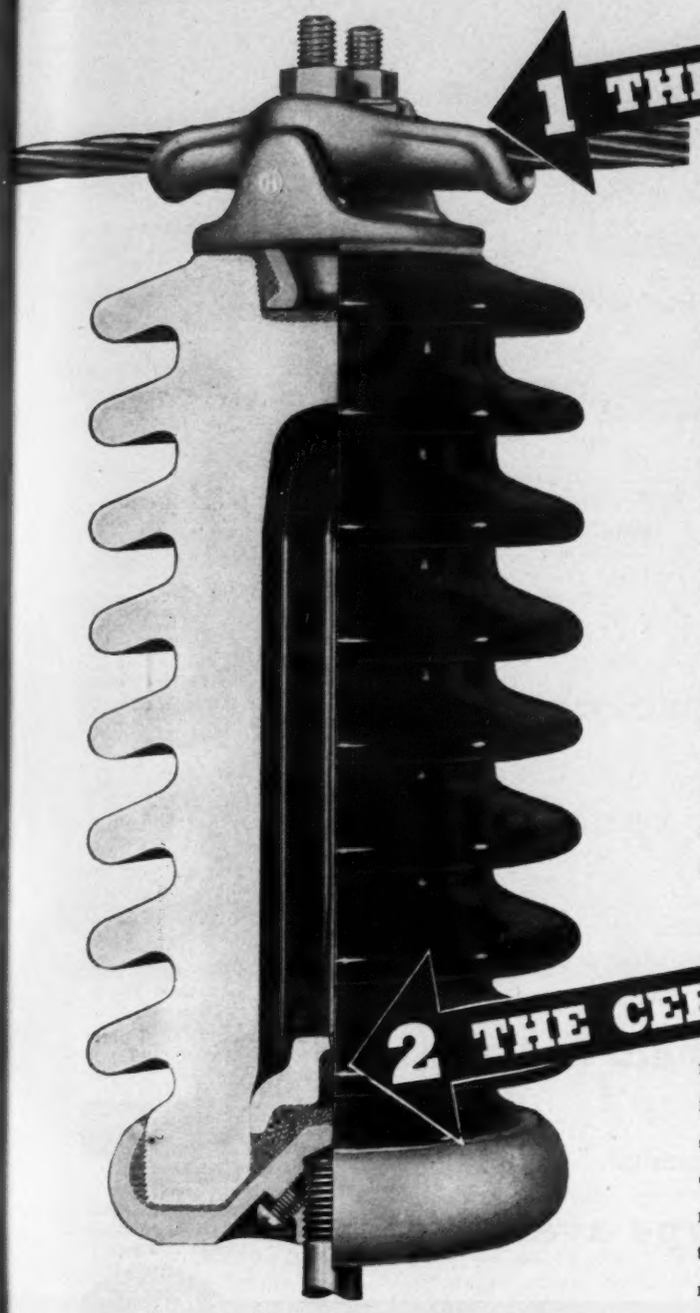
◀ PERMANENT MOUNT TACHOMETER

"FRAHM" . . . . VIBRATING REED INSTRUMENTS

for measuring speed, frequency and rates of vibration

JAMES G. BIDDLE CO. · 1211-13 ARCH STREET · PHILADELPHIA 7, PENNA.

O-B Gives You TWO LINE POST IMPROVEMENTS



1 THE CLAMPTOP

1 Clamptops, available in 11½-inch and all larger size O-B line posts, eliminate the use of several feet of pure copper tie wire at each insulation point and thus conserve a considerable quantity of highly critical material. This clamp is easily worked with hot line tools. Clamptops are radio-silent and thus re-enforce the inherent good radio qualities of line posts. In addition, the general appearance of Clamptops is extremely neat and goes well with the post-type insulator whose appearance is often some factor in its selection.

2 THE CERAMIC SEAL

2 The good dielectric and radio qualities of line posts depend upon a totally and permanently dry interior cavity. O-B seals this cavity with a ceramic barrier, glazed into place. This barrier is inserted prior to firing of the porcelain. At maximum temperature, the glaze becomes fluid. At this time, most of the air inside has escaped past the barrier. As soon as cooling starts, the glaze sets and completely seals the cavity and traps a high vacuum. Later, the barrier is pierced with a small hole and this vacuum measured in order to prove absolute air-tightness. Dry, inert gas is then pumped into the cavity and the hole re-sealed. The O-B Ceramic Seal is impervious to the passage of air and is not affected by time. Interior of the post remains permanently dry and the unit's electrical characteristics remain permanently stable. No perishable organic material is used to preserve the vital seal in O-B line posts.

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MANSFIELD, OHIO

CANADIAN OHIO BRASS CO., LTD., NIAGARA FALLS, ONT.

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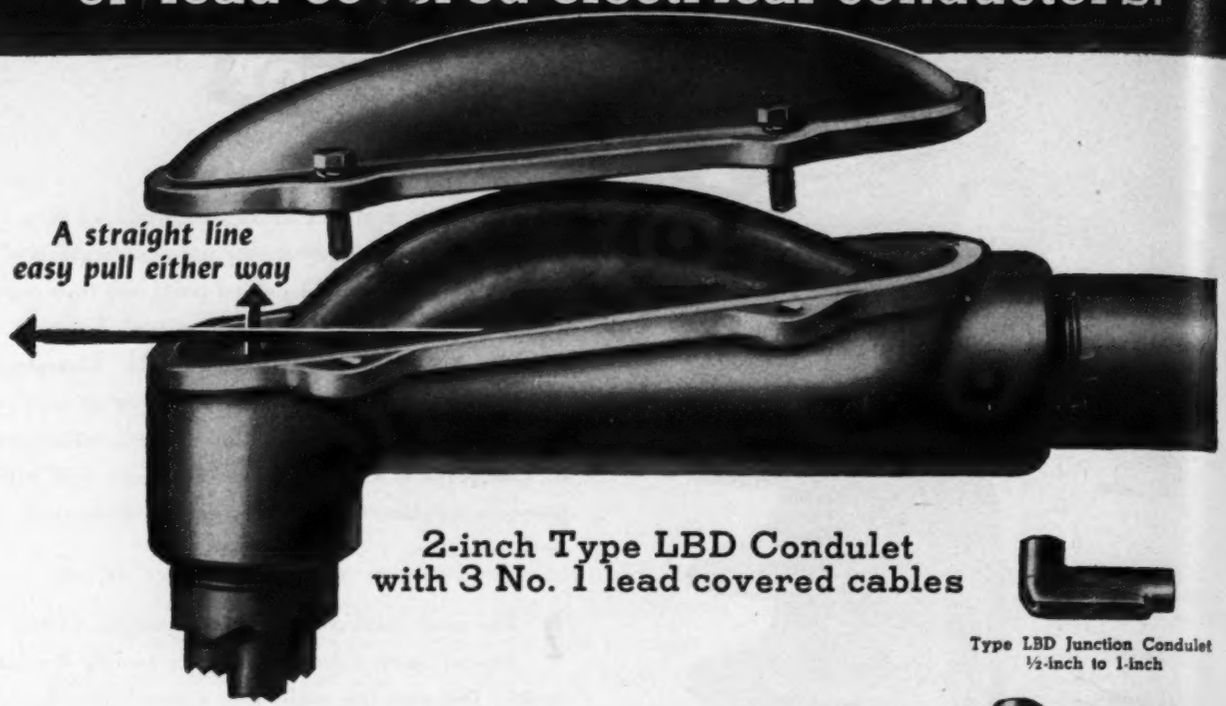
CROUSE-HINDS

Originator of the **straight line pull** type of junction **Condulet** for large or lead covered electrical conductors.



2-inch Type LBD Condulet with 3 No. 1 lead covered cables

Type LBD Junction Condulet
½-inch to 1-inch

Type LBD Junction Condulet
1¼-inch to 2-inch

Type LBD Junction Condulet
2½-inch to 6-inch

Type LBH Explosion-Proof and Dust-tight Junction Condulet
½-inch to 3-inch

- **A straight line pull** through <u>either</u> hub. Saves time.
- **Unobstructed pulling space.** Easy to manipulate conductors.
- **Domed cover.** Provides extra space to prevent sharp bends that are likely to injure conductor insulation or sheath.
- **Gaskets** can be furnished. They make the condulet vaportight and raintight.
- **13 sizes.** For ½-inch to 6-inch conduit.
- An **Explosion-proof** type available. Type LBH in 8 sizes, ½-inch to 3-inch.

CONDULETS, manufactured only by CROUSE-HINDS, are the Standard of Quality in the field of electrical conduit fittings.

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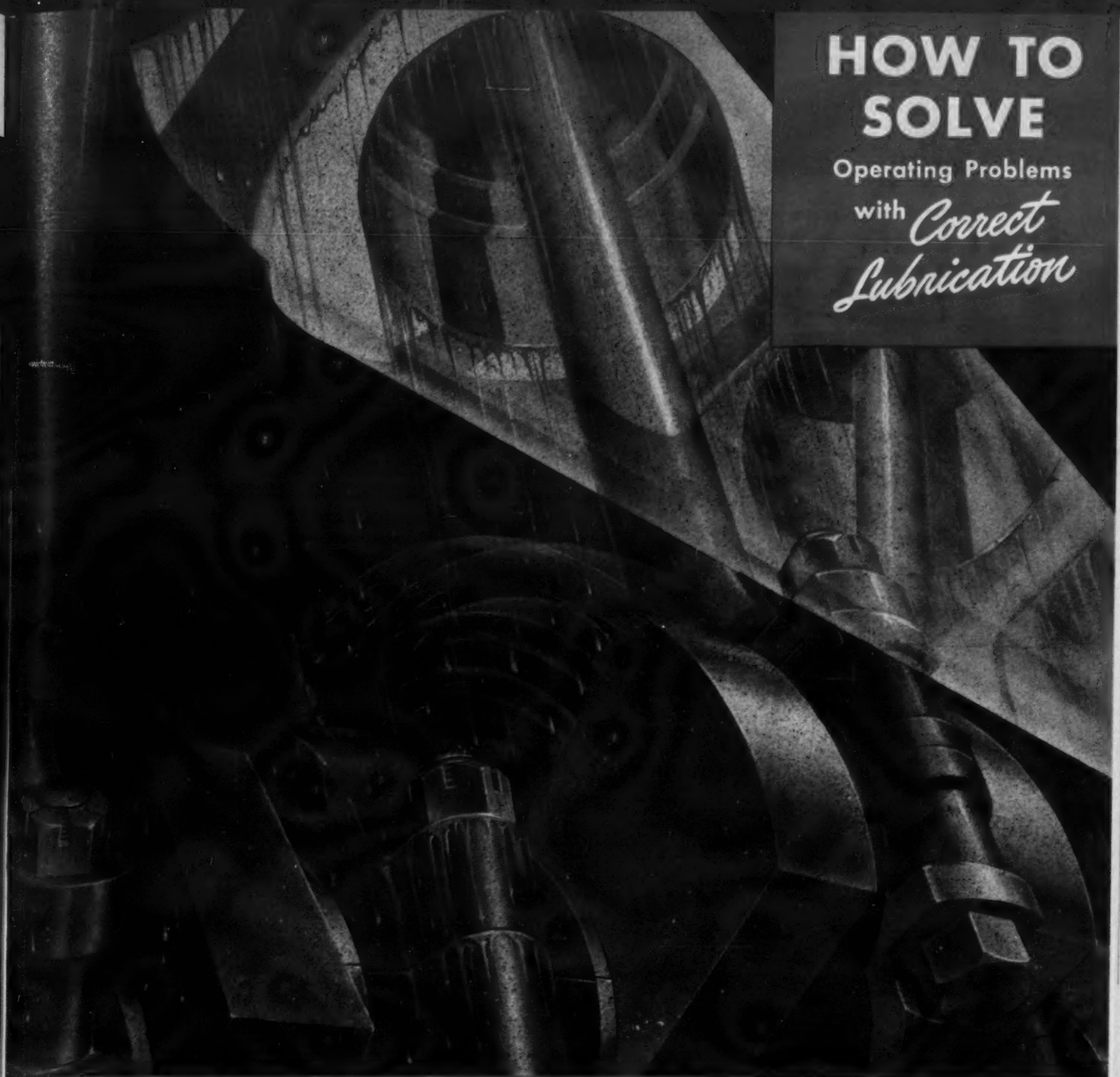


HOW TO SOLVE

Operating Problems with *Correct Lubrication*

Get "Air Raid" Protection

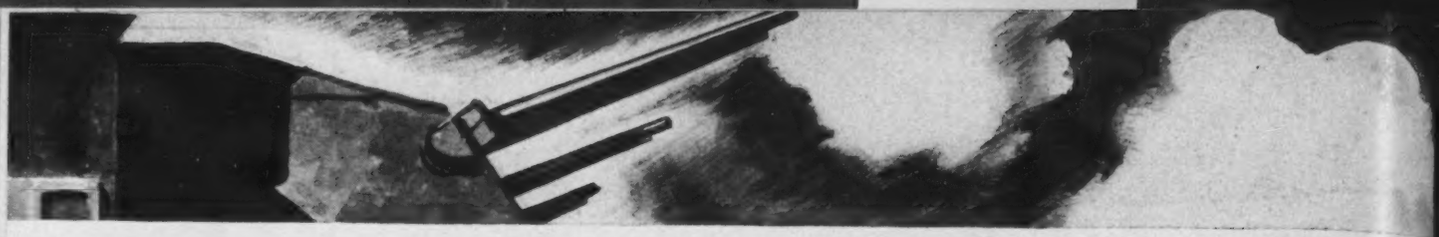
PROBLEM: Every Diesel operator well knows that the crankcase of a Diesel engine is a torture chamber for lubricating oil. Just look at that picture above. As the oil escapes from the ends of the bearings, it is whipped into a fine mist by the crankshaft and rods. In this finely divided form the oil is attacked by hot air. These factors tend to make the oil oxidize, form harmful deposits.

ANSWER: To resist this terrific punishment, oil must have great stability. It must be made from carefully selected stocks; refined with the greatest skill. Backed by 77 years' experience, Socony-Vacuum has created "correct" oils for every size and type of Diesel. *Gargoyle D.T.E. Oils 1 to 5* give maximum protection and stability in large and intermediate Diesels, *Delvac "500 and 900 Series" Oils* in small, high-speed engines.

GARGOYLE Lubricants

SOCONY-VACUUM OIL COMPANY, INC.— Standard Oil of N. Y. Div. • White Star Div. • Lubrite Div. • Chicago Div. White Eagle Div. • Wadhams Div. • Southeastern Div. (Baltimore) • Magnolia Petroleum Co. • General Petroleum Corp.

CALL IN SOCONY-VACUUM



BATTLE SCENE IN A POWER PLANT

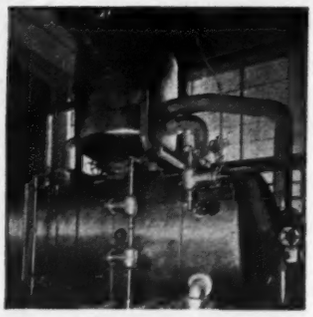
THE SLAMMING ROAR OF THE BIG GUNS is dulled to heavy thuds, in the strained quiet of below decks, while the big battlewagon rolls to the recoil of tons of metal starting their flight toward the enemy. In the ship's power plant there is a tensity, a supreme watchfulness of equipment, dials, indicating instruments, and a split-second response to orders transmitted from above. Engineer officers, their staffs and their equipment are winning the battle just as surely as the men at the fire-control stations. In the stress of battle, there must be no power failure.

So Elliott deaerating feedwater heaters, serving in Uncle Sam's fighting ships, must be—and are—as dependable in their performance as the very guns themselves. They help to win battles.

These units are working in steam plants of all kinds, ashore and afloat. They heat the water to the saturated temperature of the steam supplied, at the same time accomplishing the removal of corrosive gases. They are fully automatic in operation. Elliott engineers are glad to work with you toward getting the best possible heat balance set-up for your plant. Full details and bulletin upon request.

ELLIOTT
DEAERATING FEEDWATER HEATERS

help to win battles on land, too. On the home front in the nation's power plants, deaerating heaters have long been essential equipment. They are doing their part in the battle of production.



Elliott 400,000-lb. per hr. unit designed for operating pressure of 100 lb. gage. One of several such units in a large utility plant.

ARMY E NAVY

ELLIOTT COMPANY

Deaerator and Heater Division
Heat Transfer Department JEANNETTE, PA.

DISTRICT OFFICES IN PRINCIPAL CITIES

TOUGH TEST

you can easily make proves new "extra flex" Fiberglas sleeving is non-fraying

A new sleeving which we have just developed is as flexible as a piece of string and also non-fraying. A buyer of thousands of feet of sleeving was convinced of its flexibility, but skeptical of our non-fraying claims until he applied a tough test of his own, which you can easily duplicate—this way:

Secure from us a sample of new BH extra flexible Fiberglas Sleeving equal in size to the saturated sleeving you now use. Insert the end of a mechanical pencil into the ends of both the new BH extra flexible Fiberglas Sleeving and your present saturated sleeving and push *hard*. BH extra flexible Fiberglas Sleeving will spread slightly *but without breaking*. The usual saturated sleeving will break down at the edges and separate. As an added test, tap the ends of both pieces of sleeving with your finger. Continued manipulation will produce only the slightest fuzz on the BH extra flexible Fiberglas sample, whereas the saturated sleeving will readily unravel and become progressively worse.

NON-FRAYING • FLEXIBLE • HEAT-RESISTANT
NON-INFLAMMABLE • WATER-RESISTANT
NON-CRYSTALLIZING at LOW TEMPERATURES

The new BH extra flexible Fiberglas Sleeving is woven from the choicest continuous-filament Fiberglas yarns. It possesses high dielectric strength, is water-resistant and, like all BH Sleeving and Tubing—is non-inflammable.

All sizes, from No. 20 to 5/8", inclusive, are available. Write for samples of this radically new and different sleeving today—in the sizes you desire. Seeing is believing! Bentley, Harris Manufacturing Co., Dept. W, Conshohocken, Pa.

BH PRODUCTS

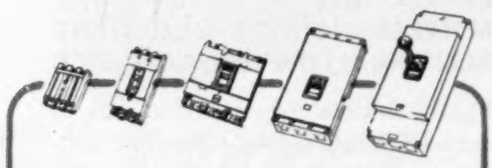
NON-BURNING IMPREGNATED MAGNETO TUBING • NON-BURNING FLEXIBLE VARNISHED TUBING • SATURATED AND NON-SATURATED SLEEVING

BENTLEY, HARRIS MANUFACTURING CO.
Conshohocken, Penna.

no "A.W.O.L"s *here*

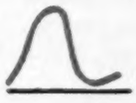
WESTINGHOUSE NOFUZE BREAKERS ARE ON ACTIVE DUTY—

mobilized to protect war circuits



NOFUZE "DE-ION" BREAKERS

prevent *harmless* overloads from interrupting war production.



protect circuits from *dangerous* overloads and "shorts".

restore service *instantly* with just a flip of the switch.

WESTINGHOUSE

Absent? Yes. Absent for the duration from peacetime applications because the Westinghouse production of Nofuze Breakers is devoted to war requirements.

But far-reaching improvements are resulting from this wholehearted participation. For example, in the new line of "F" Frame Breakers, all ratings from 15 to 100 amperes have been redesigned into one compact frame size. Instead of 14 different models, 4 now serve the same purpose.

In a typical panel, the new breaker results in a saving of 38% of the steel and 18% of the copper over present panels. And although the new breaker is smaller and weighs less than half of some of the superseded units, it has better performance.

Westinghouse engineering facilities have been placed on a broad consulting basis to help with the job of protecting vital war circuits from unnecessary interruptions. Westinghouse Electric & Manufacturing Co., East Pittsburgh, Pennsylvania.

J-60522

Westinghouse

PLANTS IN 25 CITIES... OFFICES EVERYWHERE

NOFUZE CIRCUIT PROTECTI

Aviation—A Progress Report

The Lessons of War Become the Key to a Richer Peace

TUNISIA, PANTELLERIA, SICILY—stepping stones to momentous events! But that is not all. For they spell out across the blue waters of the Mediterranean a pattern of invasion that has progressed far since last summer's first major Commando operation against the French coast.

From Dieppe, you remember, too many of the raiders never got back. But in Tunisia, and on through Sicily, the Allied might plowed inexorably forward, winning objective after objective at a surprisingly low cost in casualties. Air supremacy over the battlefield? Yes. But we have learned, too, how to save lives and shorten the war by strategic air bombardment as a prelude to invasion.

Thus the bombardment plane—rarely seen by the doughboys on the fighting fronts—is destined to save their lives by hundreds of thousands in the decisive attacks that are to come. This fact is confirmed by the cold calculations of the responsible strategists. It will give renewed courage and confidence to every member of the armed forces and of the home fronts throughout the United Nations.

For instance: thorough strategic bombardment of an objective reduces by nearly fifty per cent the surface forces required for invasion. Anticipated losses are reduced from more than fifty per cent of the original ground force to about twenty per cent. Precision bombardment—as used on railroad objectives in Rome—reduces this percentage of loss still further when it is followed by offensive action on the ground.

This is the fifteenth of a series of editorials appearing monthly in all McGraw-Hill publications, reaching more than one and one-half million readers. They are dedicated to the purpose of telling the part that each industry is playing in the war effort and of informing the public on the magnificent war-production accomplishments of America's industries.

The inference is clear. Effective prosecution of the war will require smaller ground combat forces and much larger air forces than some of our strategists once thought.

Our most urgent need, then, is for ever-mounting fleets of aircraft. And, fortunately, this is just what we are getting. The American aircraft industry now is producing as many airplanes as all the rest of the world combined. In 1938 we made 100 planes a month. Now we make three times that many in a single working day. By the end of 1943, our production rate will be about 10,000 a month.

But at this stage of the war, types of planes are more important than mere numbers. In the early months the program was heavy, and properly so, with single-engine trainers. Then, as training planes accumulated, the emphasis shifted to heavier types. Now we are turning out multi-engined bombers at a rate that is the envy of the entire world. Some months ago the President revealed that we were manufacturing 500 long-range bombers every month. The figure was conservative even then. And soon we shall be producing planes of this one type at a rate adequate to replace the normal losses of a fleet of at least 1000 American heavy bombers operating as continuously as the weather will permit.

A glimpse of the poundage production may help us still further to evaluate the miraculous achievements of the aviation industry as a whole. It was 89,000,000 in 1941 . . . 291,000,000 in 1942 . . . 911,000,000 in 1943 . . . and 1,417,000,000 in 1944

– if we need it. There you have the magnificent record of the American aircraft manufacturing industry – a monument to the cooperation of industry, labor, government, and to all-out teamwork between the aviation industry and those other industries which have converted their facilities to the manufacture of airplanes.

What of our enemies and our Allies?

German production probably has flattened out at 2500 a month – with downward revision in immediate prospect. Japan may be able to produce as many as 1000 planes a month – until we get our new long-range super-bombers in sufficient numbers to whittle down that figure. Italy may be able to turn out her 500 a month – for a little longer. At best the maximum Axis monthly total is 4000.

Add to our monthly score of nearly 8000, a total of approximately 4000 for Britain, Canada and Russia, and the United Nations score comes to 12,000 monthly. There we have a three to one advantage for our side. And between our own rising production and the brilliant operations of our bomber commands we should soon boost the ratio well above that figure. Therein lies the certainty of continued and growing air superiority over all the far-flung battlefields.

The critics of American airplane quality have been silenced ever since the ratio of enemy combat losses to our own on bombardment missions surpassed four to one. In the Pacific where our heavily armed and armored planes are knocking off the desperately stripped racing craft of the Nipponese, enemy losses often run as high as eight to one or more. In the Mediterranean theater, where the Italians were abandoned by their Allies, the story is much the same. Only in the well-defended homeland of the Nazis do we sometimes drop below the average, but even in those rare instances the ratio is still well in our favor and the effectiveness of our bombardment is adding constantly to our margin.

* * *

Behind the production lines the battle of research and design still rages. In many a laboratory night-shift, on many a secret test field, new and terrible surprises for the enemy are in the making. Super-bombers, destined for Tokyo, have long since passed out of the design stage and the Japanese may learn about them almost any day. New discoveries, designed to sow swift and silent devastation, are farther along than our enemies believe. No longer will fog or storm or night be permitted to fight on the side of our foes.

The men of science who are toiling to broaden the horizon of our knowledge stand today on the threshold of discoveries that have been sought for centuries. New reservoirs of power may soon exert a profound influence in many fields of technology and through them on our way of life.

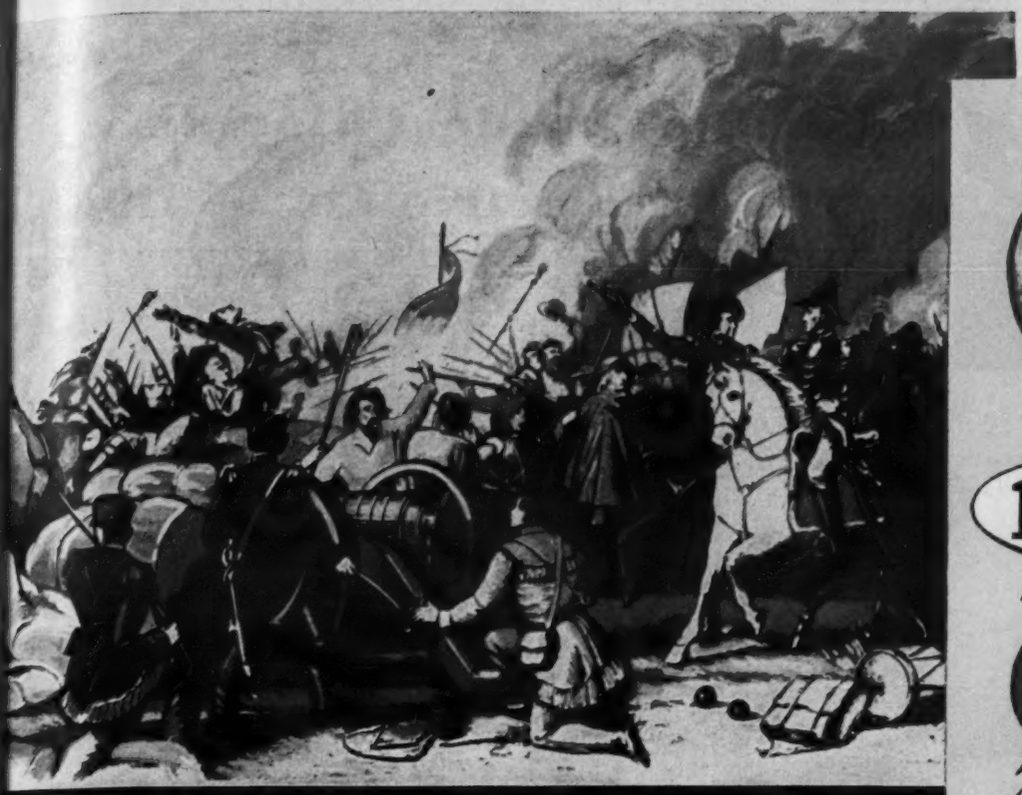
Once the war is won these new discoveries will be translated into better living. No longer will countless thousands spend their lives within their own communities or countries. New efficiencies in transportation will bring world travel within the reach of many who once had to stay at home. New family vehicles will navigate the skyways as easily and safely as the highways. Already more than a dozen manufacturers of airplanes, ships, automobiles, and electrical equipment are designing, building, or flying rotary-winged aircraft such as the helicopter or autogyro to meet the needs of tomorrow's families. New and safer aircraft of the fixed-wing type are ready for production as soon as materials become available.

The quality that now makes each of our war planes worth so many of those built by our enemies will be translated into the sturdy reliability demanded by peacetime operation. The devices that seek out and find our enemies behind the veil of fog or darkness will, after the war, reduce weather hazards to the point where they will be no greater in the air than on the ground.

Science and industry will continue to do their jobs and do them well. But if the world is to be made a better place for men to live in, statesmanship must not fail to do its part.

James H. McGraw, Jr.

President, McGraw-Hill Publishing Company, Inc



POOR COMMUNICATIONS COST 2000 LIVES

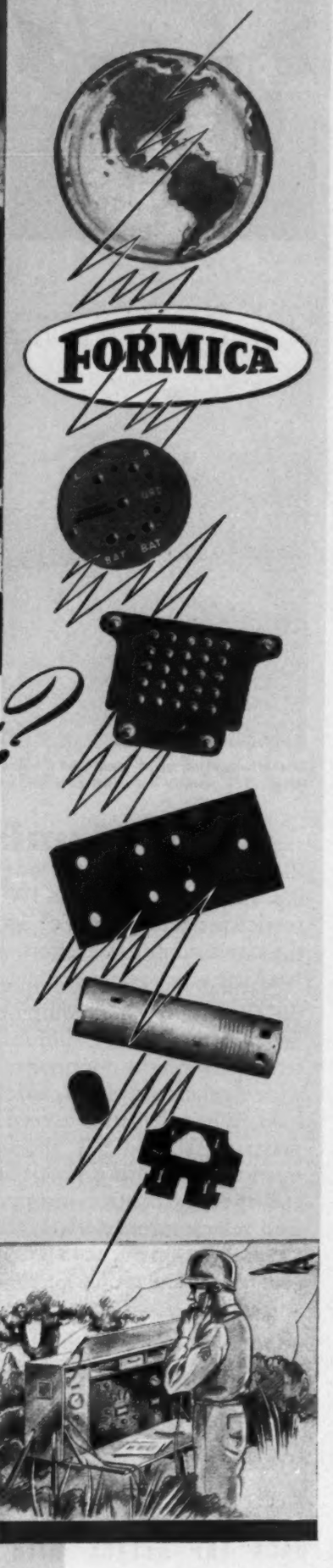
What about Ours Today?

THE unnecessary war of 1812 was declared two days after Lord Castlereagh announced in England that the "Orders in Council" (which caused the quarrel) would be repealed — but the Congress of 1812 didn't get the news in time.

The final battle of New Orleans, costing 2,000 lives, was fought fifteen days after peace was signed at Ghent — but the armies hadn't heard the news.

Today news, propaganda, and battle orders can girdle the globe in a second if communications equipment is functioning perfectly.

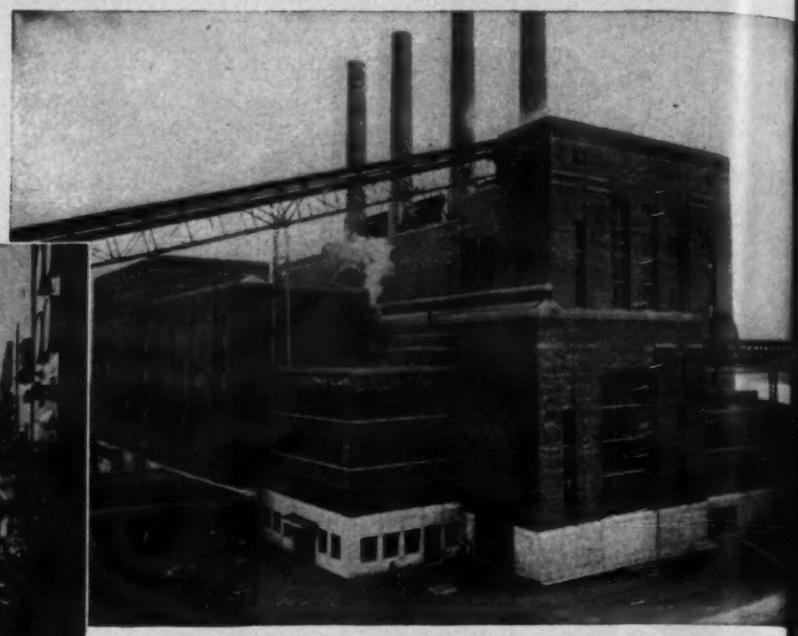
Radio parts made of Formica help civil and military communications function perfectly because of Formica's excellent insulating qualities at radio and audio frequencies. In addition, Formica is light, strong, tough, moisture resistant, and readily machined. A material possessing such properties will have many new uses in the close knit world of tomorrow, some uses in your product no doubt.



ARMY E NAVY

THE FORMICA INSULATION COMPANY
4630 Spring Grove Avenue, Cincinnati, Ohio

. . . means Exide Chloride with the Union Electric Co. of Illinois



This new plant of St. Louis' Union Electric Company adds 100,000 h.p. of electricity to the city's supply.

Careful checking of all operations helps make vital equipment last longer . . . assures top-notch performance.

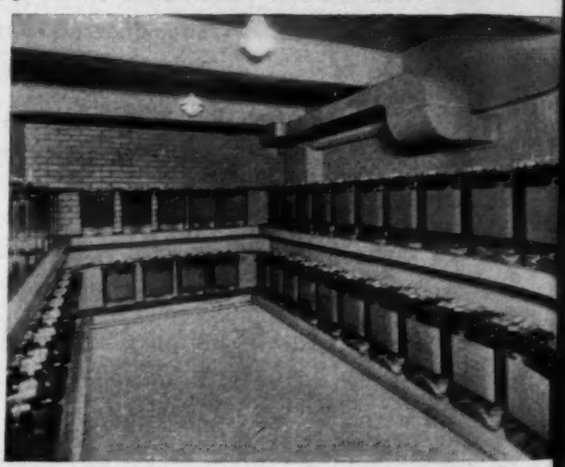
St. Louis can be proud of Union Electric's Venice No. 2 Power Plant. The new 100,000 h.p. turbine added to the 100,000 h.p. turbine already in service provides a total of 200,000 h.p. to help maintain the city's mighty war effort.

Naturally, a plant so important as this one must have the finest of modern equipment, including long-lasting, dependable Exide Chloride Batteries. These fine batteries perform the important service of floating in parallel with a generator which carries the 125 volt direct current load. When demands exceed generator output, or if the generator should fail, the batteries supply energy for opening and closing circuit breakers, operating governor and rheostat controls on main units, operating motorized valves, signal devices, transformer tap changers, and supplying emergency service for lighting, magnetic separators, and clocks.

That Exides have been chosen for this important work is one more evidence of performance tested over long years. Exides are known for dependability, long-life, and ease of maintenance. When you buy an Exide, you *Buy to Last* . . . guard them well, and *Save to Win*.

THE ELECTRIC STORAGE BATTERY CO., Philadelphia
Exide Batteries of Canada, Limited, Toronto

This 60-cell FM-17 Exide Chloride Battery is an important safeguard to plant operation.



BACK THE ATTACK WITH WAR BONDS . . . LET'S OVER-SUBSCRIBE THE 3RD WAR LOAN

It's there in an Emergency

The KEARNEY FUSE LINK DISPENSER

Equipped with a

PUL-TAB FUSE-PAK of KEARNEY FUSE LINKS

Operating men, particularly those responsible for the flow of power into our vital war industries—Army, Navy, Air Corps, and Navy projects—have been quick to see the advantages of having—the right fuse link, at the right place, at the right time.

And when you install Kearney No. 12165 Fuse Link Dispensers equipped with Pul-Tab Fuse-Paks on the poles at important locations—you're ready for emergencies with extra and proper fuse links which come in the handy Kearney Pul-Tab Fuse-Pak. You'll find these dispensing boxes handy, too, mounted in trouble trucks—with various rated links, ready for emergencies.

Note above, the Pul-Tab Fuse Pak with clearly identified links. And note, too, the handy five-Pak, twenty-five link carton.

Precision-Built FUSE LINKS

Recognizing the urgent necessity of providing fuse links which will avoid unnecessary outages on lines protected with modern Fuse Switches and Cutouts, the Kearney Corporation offers a line of improved fuse links that have accurate, low temperature, pure tin fuseable elements, which carry normal loads safely and likewise isolate faults promptly. Thus, operating men throughout the country are using these dual-purpose links in Kearney Trip Out, Trip-O-Matic and Trip-Saver Switches and in other conventional cutouts, too.

Really, since they cost no more, take advantage of the protection which these Kearney precision-built fuse links provide . . . And remember, they come packed in handy Pul-Tab Fuse Paks, 5 links to a Pak. Each link is in an individual bag with amperage rating clearly printed on the "pul-tab." Standard square cartons contain 5 Fuse-Paks, a total of 25 fuse links. Order No. 12165 boxes and Fuse Paks now for emergency advantages.

JAMES R. KEARNEY CORPORATION — JAMES R. KEARNEY CORPORATION ST. LOUIS, MO. — **4236 CLAYTON AVE., ST. LOUIS, MO.**

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Warehouse Stocks Maintained at Chicago and Los Angeles.

GOT A MAN-POWER PROBLEM?

Type "MK-39"
23 Kv, 600 Amp.

John's in the service . . . Bill's on vacation . . . poor old man Smith's putting in long hours trying to keep things going. Tough times, these — tougher days, overtime, ever-increasing costs ahead.

But there's one way to help lick this situation. Buy dependable equipment only — simple, rugged equipment you know will give less trouble, reduce maintenance. Buy for economy of time and money, not to save on first cost only to waste two or three times the saving and many precious hours on maintenance. NOW, MORE THAN EVER BEFORE, QUALITY BUYING IS IMPERATIVE.

For thirty-five years DELTA-STAR has had a reputation for manufacturing dependable equipment. The MK-39 switch is one of the outstanding examples of a product that will save maintenance costs and conserve time.

MORE-VALUE FEATURES OF DELTA-STAR MK-39 SWITCHES

HIGH PRESSURE CONTACTS at both ends of blade. Resilient springs balance pressure, reduce contact wear, insure satisfactory contact over longer time.

NO FLEXIBLE LEADS — particular advantage with high-ampere switches, less mechanical resistance under ice conditions.

SIMPLIFIED BLADE MECHANISM — no complicated levers, links, gears, etc. to get out of adjustment. Only three bearings.

FULLY CONTROLLED BLADE MOTION — variable mechanical advantage, inherent compensation for changing gravitational pull. Contact pressure is released before upswing.

ENORMOUS LEVERAGE — aids initial opening, final closing. Ice easily shattered. Toggle effects lock blade open, closed.

Simplicity

Ask for Publications

No. 4109-A
Switches Rated 400, 600 & 1200 Amperes, 7.5 to 161 Kv.

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Switches Rated 2000, 3000 & 4000 Amperes, 7.5 to 34.5 Kv.

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CANADIAN ASSOCIATE
Canadian Line Materials Limited — Toronto 13, Canada

How to be comfortable shaking hands with 6,600 volts

A typical example of B. F. Goodrich improvement in rubber

ANY man who works with 6,600 volts deserves to be as comfortable as possible. Yet many linemen still suffer the awkwardness of ordinary electricians' gloves made by repeated dipping in rubber cement to build up layers of rubber to the required thickness. That makes them hard to work in. Conscious effort is needed to bend the straight, stiffish fingers.

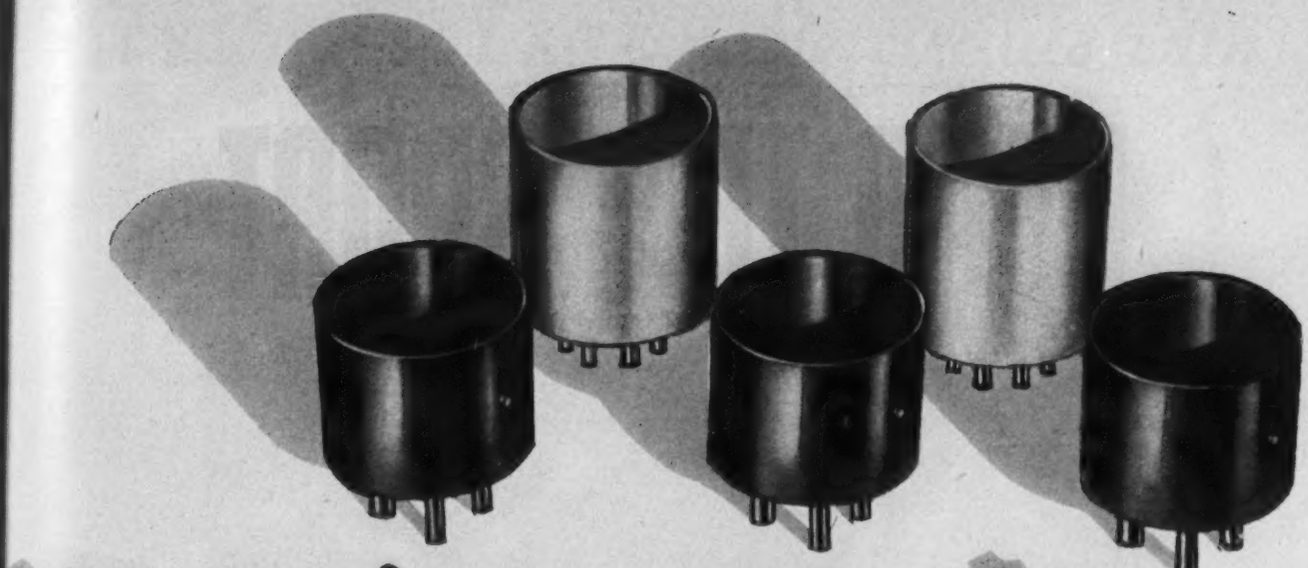
That's why B. F. Goodrich Curv-flex electricians' gloves made by the Anode process are so well liked by linemen who have had a chance to use them and find out what working comfort really is. By means of the Anode process, a B. F. Goodrich development, pure liquid latex is deposited on a form to the required thickness by a *single* dipping, avoiding the stiffening effect of several layers of rubber.

But before they made the forms for Curv-flex gloves, B. F. Goodrich research men studied human hands — made photographs and plaster casts of hands at work and hands relaxed. From these studies they designed forms to make gloves with *curved* fingers to conform to the normal position of a man's hand, with wrists and cuffs that make the gloves easier to get into and out of.

Many linemen, putting on B. F. Goodrich gloves for the first time, are amazed that they're so flexible and comfortable. Why not ask your nearest jobber or distributor to show you a pair of B. F. Goodrich gloves and see for yourself how flexible and comfortable they really are? Or, if he doesn't have them, write *The B. F. Goodrich Company, Industrial Products Division, Akron, Ohio.*

B.F. Goodrich

RUBBER *and* SYNTHETIC *products*



WANTED:

Orders for Tube Bases!

WHAT is it you need? Tube bases made of BAKELITE, or of the new MICANOL (for low loss at high frequencies)? Bases for receiving, transmitting, or special tubes?

Tell us what you're looking for. See check list below. (If you're a manufacturer of electrical equipment, perhaps we can supply you with bases for your plug-in connections.)

RCA has a complete line of tube bases to meet a wide range of requirements.

And in most cases, delivery can be started in a reasonably short time.

TUBE PARTS AND MACHINERY

WHAT TO DO:

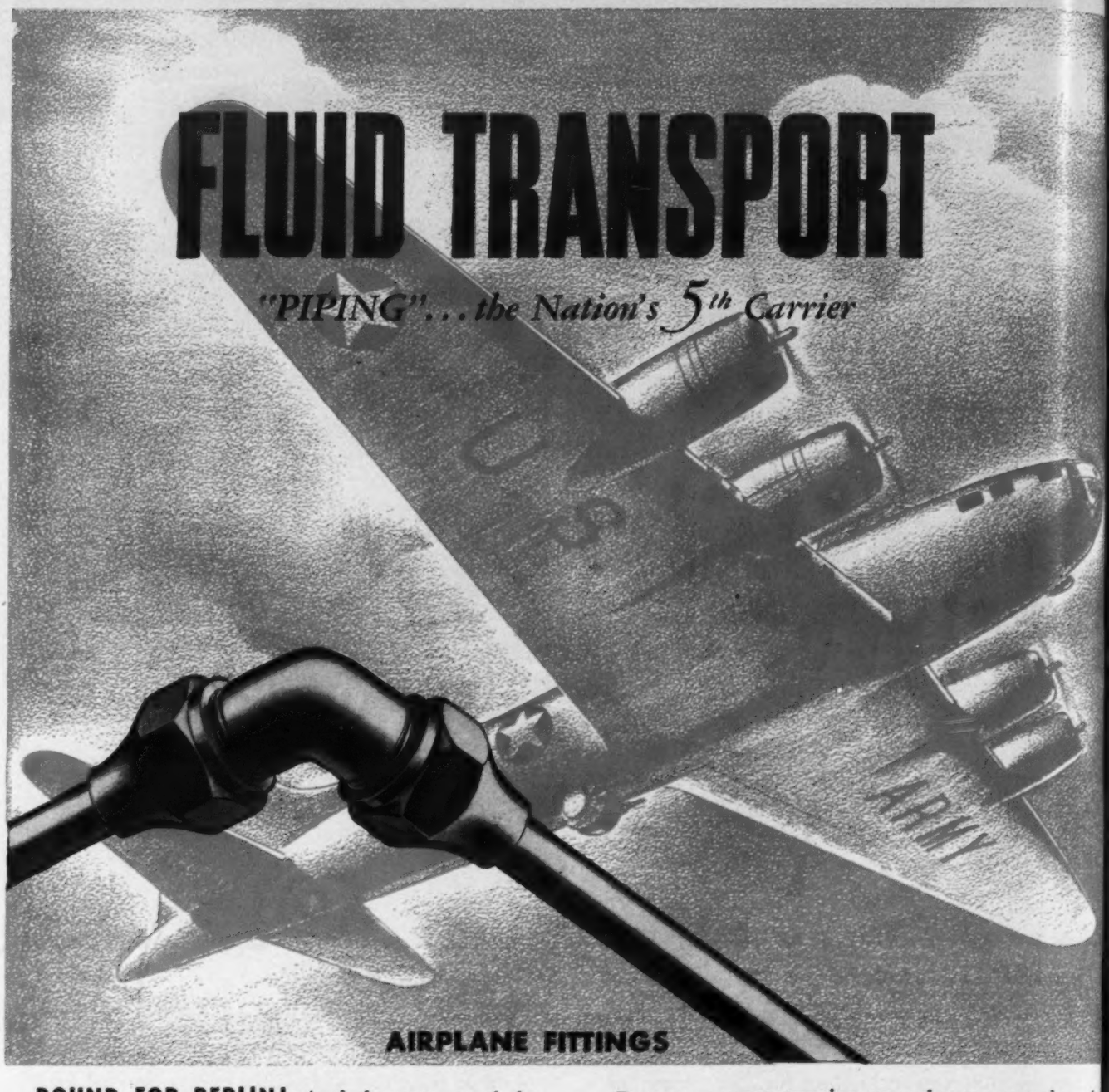
1. *Write to*: Tube Parts & Machinery Section, Radio Corporation of America, 574 South 5th Street, Harrison, N. J.
2. *Tell us your requirements*:
   (a) *Type* or types of bases needed, including *size, number of pins,* and *material* wanted.
   (b) *Quantities* of each type needed.
   (c) *Date* when deliveries should start.

RCA ELECTRON TUBES

RCA Victor Division • RADIO CORPORATION OF AMERICA • Camden, N. J.

FLUID TRANSPORT

"PIPING"... the Nation's 5th Carrier



AIRPLANE FITTINGS

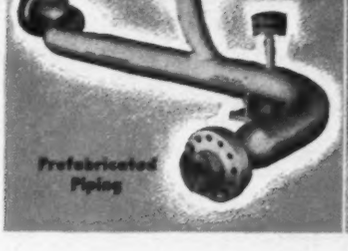
BOUND FOR BERLIN! And the success of the mission will depend upon the smooth operation of the plane—upon uninterrupted delivery of gas, oil, air, hydraulic fluids, even oxygen, through labyrinths of tubing—in essence upon FLUID TRANSPORT.

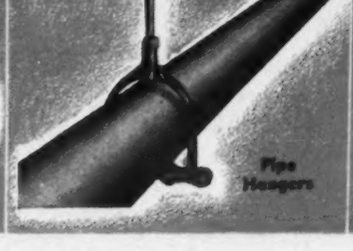
From the most delicate of airplane systems, to rugged 16" high pressure-high temperature steam lines of power plants, Grinnell supplies the component parts plus expert engineering to convert a pile of pipe into a piping *system.*

For new war construction, or maintenance and repair of existing piping, call Grinnell Company, Inc., Executive Offices, Providence, Rhode Island. Plants and offices throughout U. S. and Canada.

GRINNELL

WHENEVER **PIPING** IS INVOLVED


Prefabricated Piping


Pipe Hangers

Pipe and Tube Fittings

Grinnell Saunders Diaphragm Valves

QUICKLY ISOLATE *cable circuits with*
G & W TYPE "RA" OIL SWITCHES

TYPE "RAL" →
3 way with 2 sets
of links and tie bus.)

No covers to remove.

No seals to be broken.

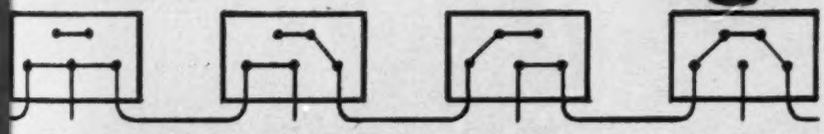
No links to unbolt.

Oil filled tanks keep size to minimum — operating shafts perfectly sealed.

Simple and safe sectionalization by merely operating external lever arms.

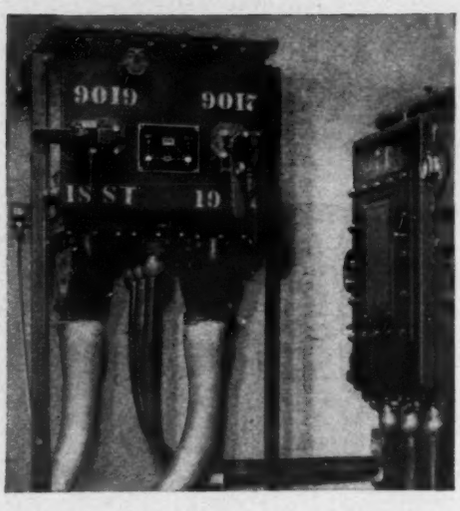
Voltage ratings —600, 7500, 15000 (shown), 23000 and 34500 —

Ampere ratings —400 (standard), 1000 and higher (special designs)



FOUR CONNECTIONS WITH ONLY TWO SETS OF LINKS

Type "RAL" three way switch, with two sets of gang-operated links and one set of tie busses, makes an ideal unit for use on loop systems. It permits the loop to feed through with or without the branch connected, also to feed the branch from either side with the other side disconnected. Thus, any section of the loop can be isolated and any branch can be disconnected without affecting the continuity of the loop. This situation formerly required the use of three separate oil switches, involving a greater expense not only of the switches but also the additional manhole or vault space necessary.



Send for new bulletin No. 743

G&W ELECTRIC SPECIALTY CO.
Cable Terminating, Sectionalizing and Protecting Equipment
7780 DANTE AVENUE, CHICAGO 19, ILLINOIS, U.S.A.
Also made in Canada by Powerlite Devices, Ltd., Toronto

Use This Check List

WHEN INSTALLING BRUSHES ON YOUR ELECTRICAL EQUIPMENT

1. See that all terminals are securely fastened to the brush holder support.
2. Remove dirt and grit from brush holders.
3. Provide 1/8" to 1/16" clearance between commutator and nearest portion of brush support in reaction and box type brush holders. Less clearance is sometimes preferable on small motors.
4. Keep angular position of all brush holders uniform with respect to the commutator.
5. Check neutral point and space the brush arms equidistant about the commutator.
6. See that toes of all brushes on each arm are parallel with commutator segment.
7. To prevent streaking of commutator, stagger brushes in positive and negative pairs.
8. Seat new brushes on commutators and rings accurately with sandpaper or a brush seating stone.
9. Adjust brush spring pressure to conform with manufacturer's recommendation.

Care exercised in the installation, fitting and adjustment of brushes increases life, improves performance and eliminates many of the possible causes of interrupted service.

NATIONAL *Carbon, Graphite and Metal-Graphite* BRUSHES

"National" brushes are doing their full share of carrying the enormous load demanded by the Nation's war effort. Essential requirements must be met first. Every effort is being made to satisfy all demands for our brushes in the shortest possible time.

Proper maintenance is paramount in keeping your electrical equipment operating at full efficiency. Many valuable and time saving suggestions as well as details of operations mentioned in the above check list are included in this series of "Modern Pyramids" bulletins. Copies are available promptly upon request.

NATIONAL CARBON COMPANY, INC.

Unit of Union Carbide and Carbon Corporation

UCC

CARBON SALES DIVISION, CLEVELAND, OHIO

General Offices: 30 East 42nd St., New York, N. Y.

Branch Sales Offices: New York, Pittsburgh, Chicago, St. Louis, San Francisco

LET'S GO! U.S.A. KEEP 'EM FLYING!

THE WORD "NATIONAL" AND THE SYMBOL ARE REGISTERED TRADE-MARKS OF NATIONAL CARBON COMPANY, INC.

Speeding the day

WHEN THERE'LL BE ENOUGH SYNTHETIC RUBBER TIRES FOR EVERYONE

Once again Westinghouse has provided the answers to the challenging problems of a new industry. Control centers, originally developed to meet the need for quickly installed group motor control, are speeding production of the polymerization process vital to manufacture of synthetic rubber.

Because Control Centers are factory grouped and wired, they speed installation, save aisle space, and provide low-cost, safe motor control.

Control Centers can be located away from hazardous points, eliminating the expense of critical-material-consuming, explosion-proof controls. Starters may be mounted on both sides of Westinghouse Control Centers—the units are all of one width and the heights are multiples of the small size. This provides greater space-savings and flexibility to meet varying conditions.

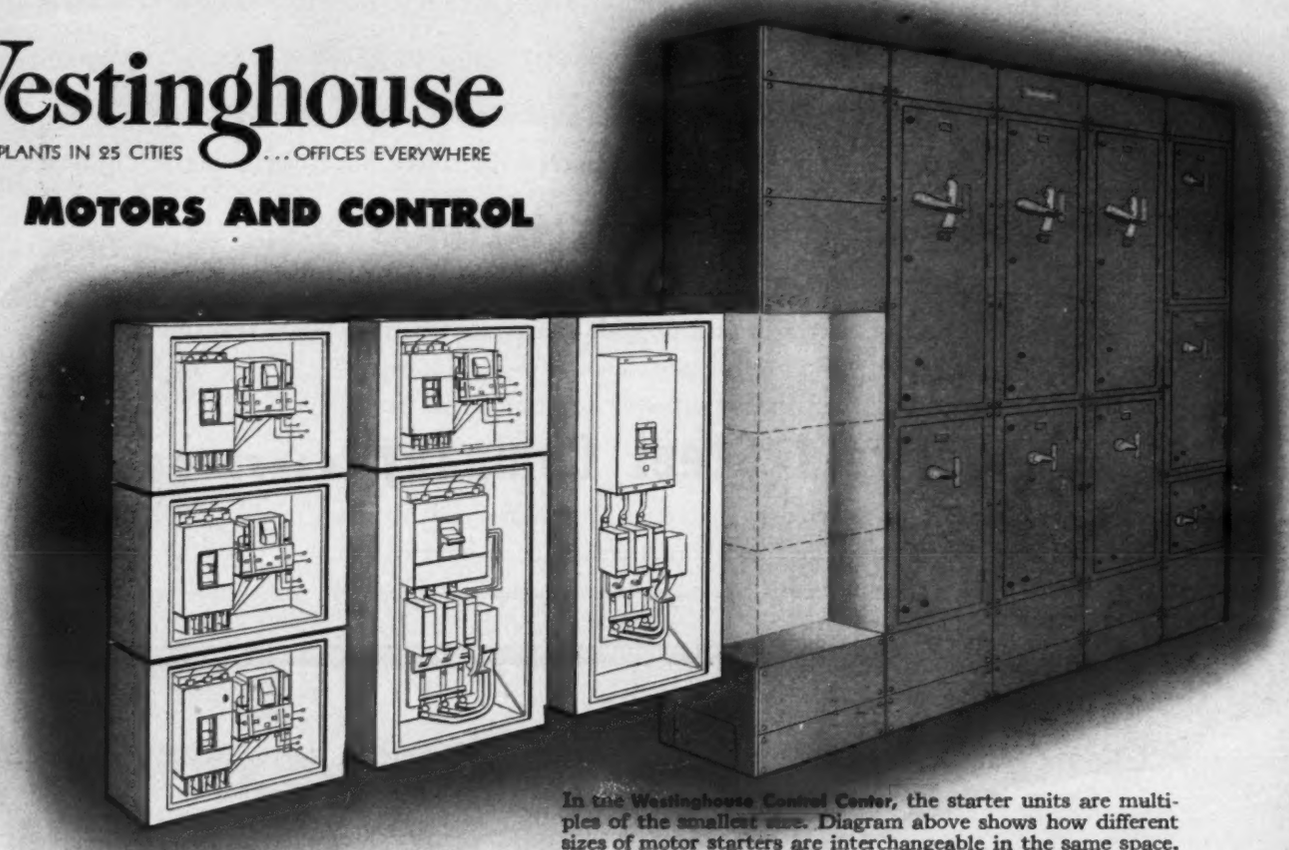
In short . . . Westinghouse Control Centers are the modern control for modern industry. Specify them for your plant . . . write for Booklet 3026 for complete details. Westinghouse Electric & Manufacturing Co., East Pittsburgh, Pa., Dept. 7-N.

J-21262

Westinghouse

PLANTS IN 25 CITIES ... OFFICES EVERYWHERE

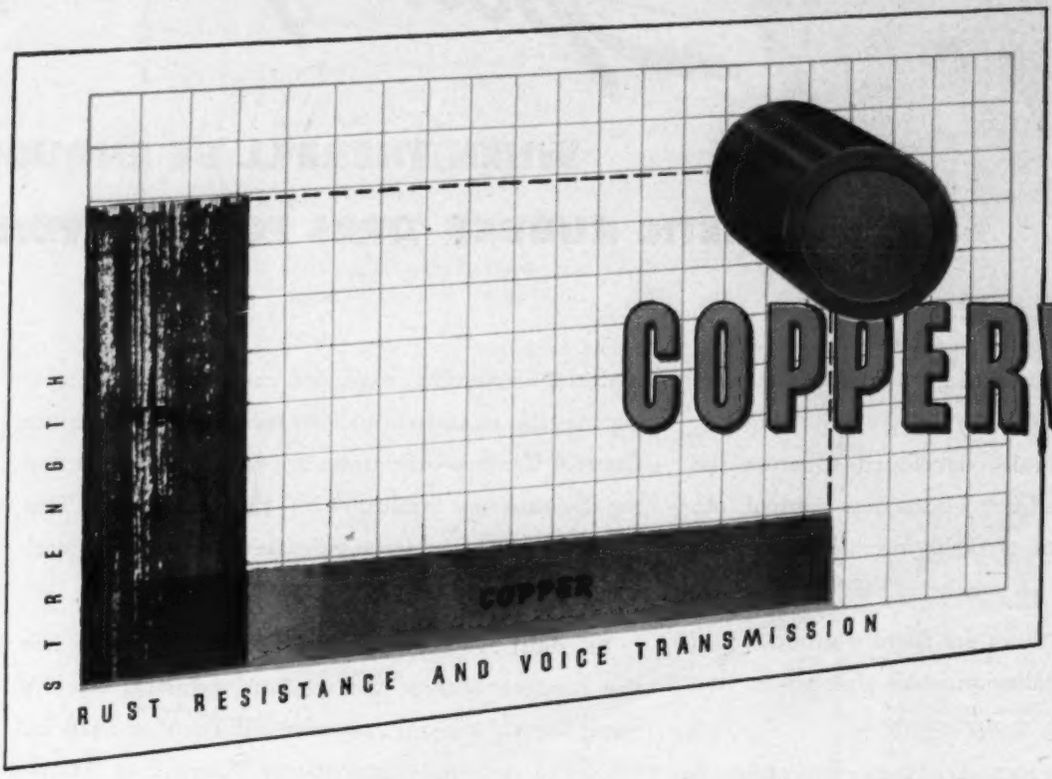
MOTORS AND CONTROL



In the Westinghouse Control Center, the starter units are multiples of the smallest size. Diagram above shows how different sizes of motor starters are interchangeable in the same space. The unit on the right encloses one Size 4 Linestarter; the two in the middle enclose a Size 1 and a Size 2 or 3 Linestarter; and the units on the left enclose three Size 1 Linestarters.

THE STRENGTH OF STEEL--

THE CONDUCTIVITY AND PERMANENCE OF COPPER--



COPPERWELD

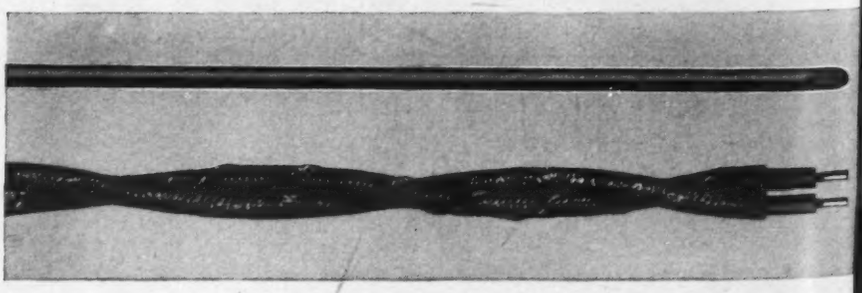
It's the combination of copper and steel in Copperweld that makes it the ideal wire where strength and permanently good voice transmission are required. Steel provides strength, but lacks rust resistance and electrical conductivity. Copper provides rust resistance and conductivity, but lacks strength. The best characteristics of both metals are united in Copperweld.

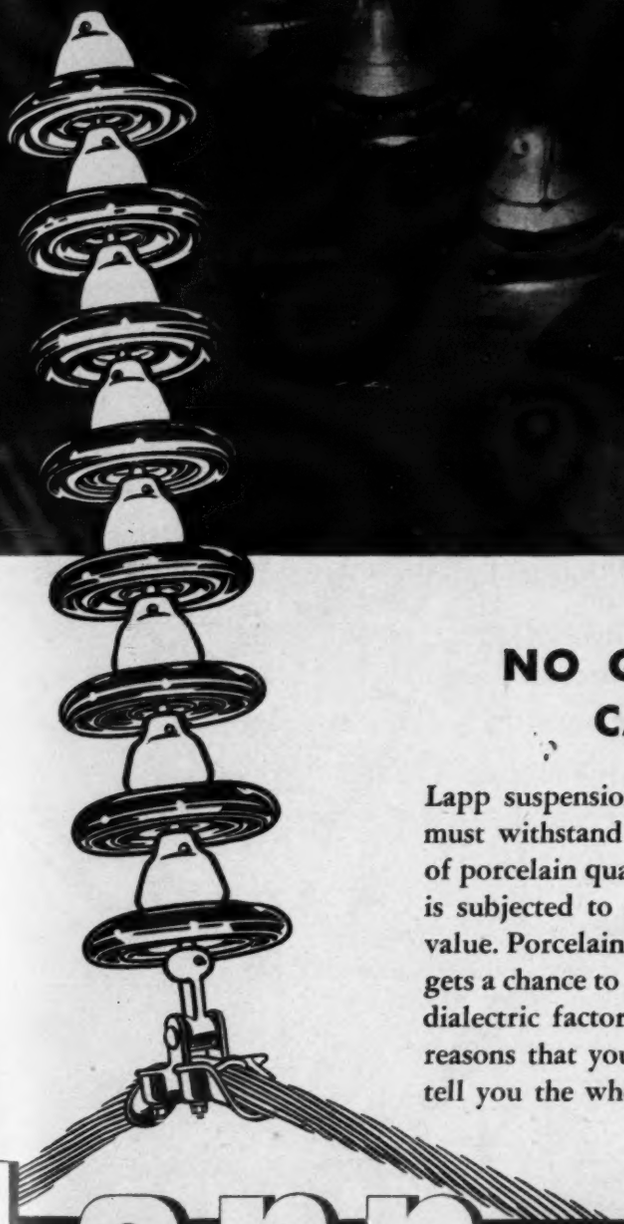
Copperweld Line Wires and Drop Wires resist rust like solid copper; both have high strength and provide permanently good voice transmission.

Copperweld Steel Company *GLASSPORT, PA.*

COPPERWELD LINE WIRE

COPPERWELD DROP WIRE





NO QUESTIONABLE PORCELAIN CAN SURVIVE THIS TEST

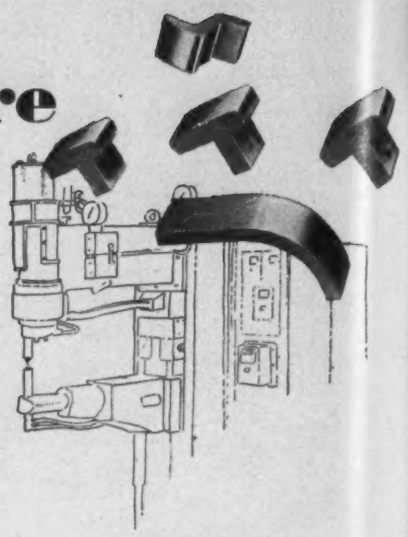
Lapp suspension insulator units, before being approved for shipment, must withstand the Overpotential Test, the industry's most severe test of porcelain quality. Its rim immersed in oil to prevent flashover, the unit is subjected to 60 cycle current at voltage higher than rated flashover value. Porcelain not up to the Lapp standard, punctures in this test, never gets a chance to fail on your lines. Units that survive are assured a definite dialectric factor of safety. The Overpotential Test is one of the many reasons that you do better with Lapp insulators on your lines. May we tell you the whole story? Lapp Insulator Co., Inc., LeRoy, N. Y.

ARMY E NAVY

Lapp

Better Porcelain • Better Insulators

As It Turned Out— 700,000 Operations Were Not "The Half of It"



It sounds like a lot—700,000 makes-and-breaks on a resistance welding machine before down-time intervened, in order that contactors in the control mechanism might be cleaned.

But when welding is carried on at top speed, every "time out" means lost production. Too much "time out" became a real problem for a big aircraft manufacturer using many resistance welding machines of the "stored energy" type.

Mallory engineers recommended the substitution of Mallory 8CC Metal for the contactors. Result—more than 1,300,000 operations before it was necessary to clean contactors—and a big cut in down-time.

Mallory 8CC is replacing copper and other metals in many types of circuit breaker contacts where a material of greater hardness, with greater resistance to wear, is needed. In applications where frequency of operation is high, Mallory 8CC will maintain a contact resistance considerably lower than that of copper.

Where problems concern circuit-interrupting devices which must break the flow of electric current almost instantaneously, with a minimum of arc hangover, Mallory 8CC may provide the quick, sure answer.

Let Mallory contact engineers help you
— their experience is at your service.

P. R. MALLORY & CO., Inc., INDIANAPOLIS, INDIANA
Cable Address—PELMALLO

P. R. MALLORY & CO. Inc.
MALLORY

ELECTRICAL CONTACTS AND CONTACT ASSEMBLIES . . . NON FERROUS ALLOYS POWDERED METAL ALLOYS

MAINTAIN HIGH DIELECTRIC VALUES

WITH DE LAVAL INSULATING OIL PURIFIERS

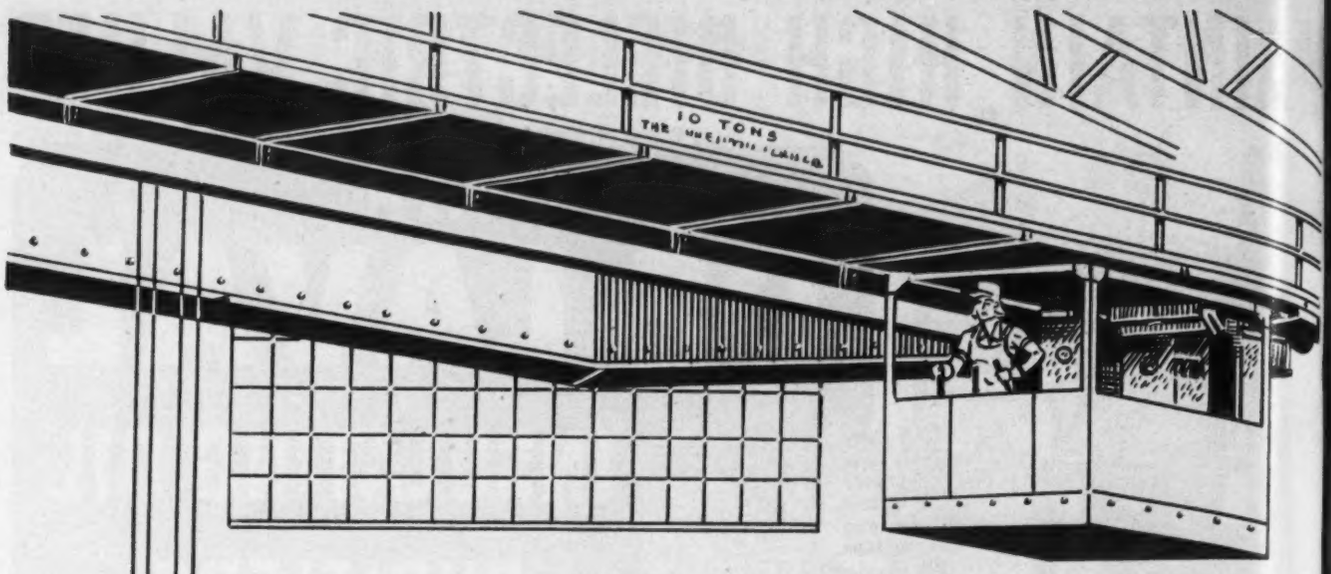
SPEED and economy of operation combine with dependability of results to make the De Laval Insulating Oil Purifier the choice of leading power systems in meeting their oil maintenance problems.

The De Laval Purifier restores the required high dielectric value of oil in a single pass, eliminating re-runs; continuously discharges water, permitting long, continuous operation at uniformly high efficiency with a minimum of attention. As a result, the yearly cost of dehydrating oil in transformers and circuit breakers can be much reduced.

Speedier, less costly oil purification, which is at the same time more positive, leads naturally to improving the average dielectric value of oil in all units, thus contributing directly to dependable sub-station performance.

THE DE LAVAL SEPARATOR COMPANY
165 Broadway, New York 427 Randolph St., Chicago
DE LAVAL PACIFIC COMPANY, 61 Beale St., San Francisco
THE DE LAVAL COMPANY, Limited
Montreal Peterborough Winnipeg Vancouver

De Laval INSULATING OIL PURIFIERS



"HURRY UP SISTER!"

"I can't—it won't go—Something's the matter with it!"

"I've got the controller-handle full on—and there's plenty of juice."

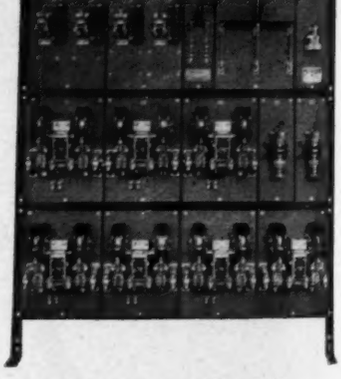
★ That's just the trouble, sister. You've got too much juice and are roasting that a.c. wound-rotor bridge motor. Back the control up toward the off point. That will reduce the current and put the motor-torque up where it belongs and get you going. The only way to handle a wound-rotor motor, operated by manual control, is to notch the control along, step by step, giving the motor a chance to get going between notches.

Now, if you had a magnetic control like the EC&M type, you could throw the master-handle full "on" without trouble, the EC&M Frequency Relays automatically taking care of acceleration and plugging for you.

This control protects the motor, too. For example, one was installed over a year ago on a foundry crane and since then there has not been a minute's delay, while on some of the other cranes in this plant, bridge motors last an average of only three months before they need rewinding.

Today, many carefully engineered cranes are equipped with EC&M Frequency Relay Magnetic Control, complete facts about which are given in Booklet 930. Write for your copy today.

Type of Master Switch used with Magnetic Control. Bulletin 1182, Type NT Master.



EC&M 37 H.P., 550 Volt A.C. Reversing-Plugging, Frequency Relay Magnetic Controller for Bridge Motion of overhead crane in steel mill.

THE ELECTRIC CONTROLLER & MFG. CO.

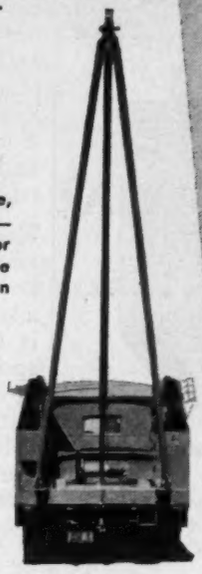
2700 East 79th Street ★ Cleveland 4, Ohio

FWD LINE CONSTRUCTION AND MAINTENANCE EQUIPMENT THAT CONSERVES CRITICAL TIME AND MAN-POWER

Model 1775 Pole Trailer Especially adapted for high-speed hauling of poles over short and long distances. Because of its wide tread, this unit trails at high speeds without snaking or whipping. Light in weight, two men can easily lift it onto a truck when moving from one operation to another.

Sure Binder (Handiest tool you ever used) The Sure Binder is a portable hand winch for binding bulky loads of all types. Ratchet type drum holds 18 ft. of 5/16 inch cable. Weight complete: 18½ pounds.

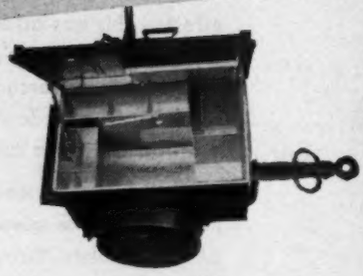
Utility Pintle Hooks Provide a sure, ... connection between truck and trailer — ...any make of truck. Available in sizes for ...ing loads of 1 ton or less and up to the ...versal type for towing anything that can ...moved.



...Type Pole Derrick Made of ...best seamless steel tubing properly ...treated. Available in sizes to handle ... from 25 ft. to 70 ft. in length.

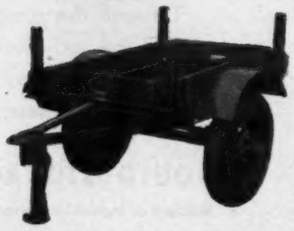
First Choice OF MORE THAN 150 UTILITIES

FWD offers a complete line of engineered trucks for Utility service. Special power take-offs for operating a winch and boring machine are incorporated into its original design. FWD builds its own cabs and Utility bodies—can furnish conventional or over-engine cabs with seating capacity from 2 to 7 men...Write for FWD catalog. "PUBLIC UTILITY TRUCKS THAT FOLLOW THE JOB."



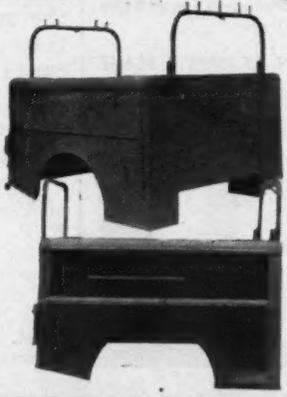
Cable Splicer's Cart—Model S All steel construction—compact—rugged—theft-proof. Compartments for every tool. Folding support leg. Capacity 1000 lbs. Available with either solid or pneumatic tires.

Combination Cable Reel and Pole Trailer This unit has electric steel spoke wheels of integral hub type. Timken roller bearings, and special heat treated chrome vanadium steel springs. All castings are electric steel cast. Axle material is 40-50 carbon steel, specially heat treated. The main frame and cross member 4", 9½ lb. I-beam. All trailers furnished with one set of pole hauling bolsters, and one set of cable reel saddles.



Combination Cargo and Pole Trailer

P8T Series. Available in heavy load capacities of 3100 to 8200 lbs. Extension tongue permits hauling of poles up to 40 ft. Optional electric brakes, side boards, stanchions, etc.



B-6 All Purpose Body

A light weight compact all steel body designed for installation on any half ton chassis. Complete unit weight does not exceed 600 lbs. Storage compartments contain over 54,000 cubic inches. Full height clothing and material compartment. Corrugated steel floor, reduced weight increased strength. Full standardization of design permits easy replacement of damaged body parts or complete sub-assemblies. Tail gate can be secured at 45 degree position, level with floor or fully dropped. Rear ladder bracket removable. Telescoping door stops and solid wood insert converts upper rite door to full length work table and vise holder.

OTHER UTILITY TOOLS

- Earth Boring Machines
- Power Take-Offs
- Duct Rodding Machines
- Low Bed Trailers
- Trailer Hitches
- Cable Laying Plows
- Steel Utility Bodies For Pick-Up Trucks
- Guy Wire Forming and Cutting Tools

SEND FOR LITERATURE

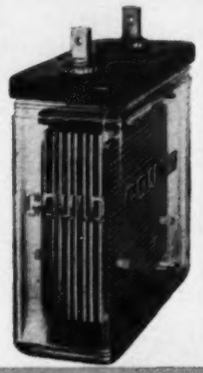
Distributed and guaranteed by GraybaR ELECTRIC COMPANY

...HE UTILITY SUPPLY DIVISION of the FOUR WHEEL DRIVE AUTO CO., CLINTONVILLE WISCONSIN

GOULD FACTORY-BACKED SERVICE AT KEY POINTS AVOIDS COSTLY DELAYS, MAKES QUICK REPAIRS POSSIBLE

• Speed is the essence of today's production efforts. This has added new strains on men and equipment. In hurrying to make delivery dates machines are forced to new highs, with the result that breakdowns and accidents do occur. Storage batteries are no exception to this rule.

Realizing the need for quick repairs Gould has created a special factory-backed service at key points throughout the United States. Through the completeness of Gould equipment, and the know-how of the eight Gould factories, injured batteries will again be on the firing line as good as new, with a minimum of delay.



SPECIFY GOULD PLANTE... The battery with antimony free positives for control and standby applications.

Rated Conservatively ... *Goulds equal or exceed in capacity any battery of comparable size and cell structure.*

GOULD STORAGE BATTERY CORPORATION, DEPEW, NEW YORK

Builders of industrial batteries for every application. Sales and service offices in principal cities of the U.S.A.

Factories at Depew, N. Y., North Bergen, N. J., Dallas, Atlanta, Chicago, St. Paul, Leavenworth, Los Angeles

FOR EXCELLENCE IN STORAGE BATTERY PRODUCTION AT DEPEW PLANT

GOULD

Since 1898 THE BATTERY PICKED BY ENGINEERS

THE SAGA OF A TRUCK

▶ It happened on the swing shift. Perhaps it was the poor light, or it may have been one man's endeavor to cut a corner, hoping to save a few second's time. In any event, there was a crash and the sound of cuss words out of the darkness. A platform truck has skidded, and gone over the edge.

By herculean efforts the crew managed to get the cases into the car and the order left as scheduled. The platform truck, however, was much the worse for wear. Repairs to the truck could be made in the factory shop, but the damaged battery was the bottleneck.

The superintendent decided to "*Call Gould*". A Gould service man was soon on the spot. All that could be salvaged of the wrecked battery was placed on a fast truck and rushed to the nearest Gould plant—one of the eight strategically located to serve American industry. There complete repairs were made and less than 72 hours later the truck was again in operation.

Keep charged elements wet. When an element is exposed to the air for any length of time, you will notice a steaming action taking place. This is caused by the oxidation of the sponge lead in the negative plates. It is a quite rapid chemical reaction with the oxygen in the air and results in the generation of considerable heat, as well as the loss of charge in the negatives.

Whenever it is necessary to remove or otherwise expose an element of a battery, it is essential that it be promptly immersed in clean water or battery electrolyte. If the repairs involve prolonged exposure of the negative plates the separators should be taken out of the unit and kept saturated. Then allow the negative element to dry out in a free circulation of air. In this way, although the negative plates will discharge they will not heat up enough to cause damage.

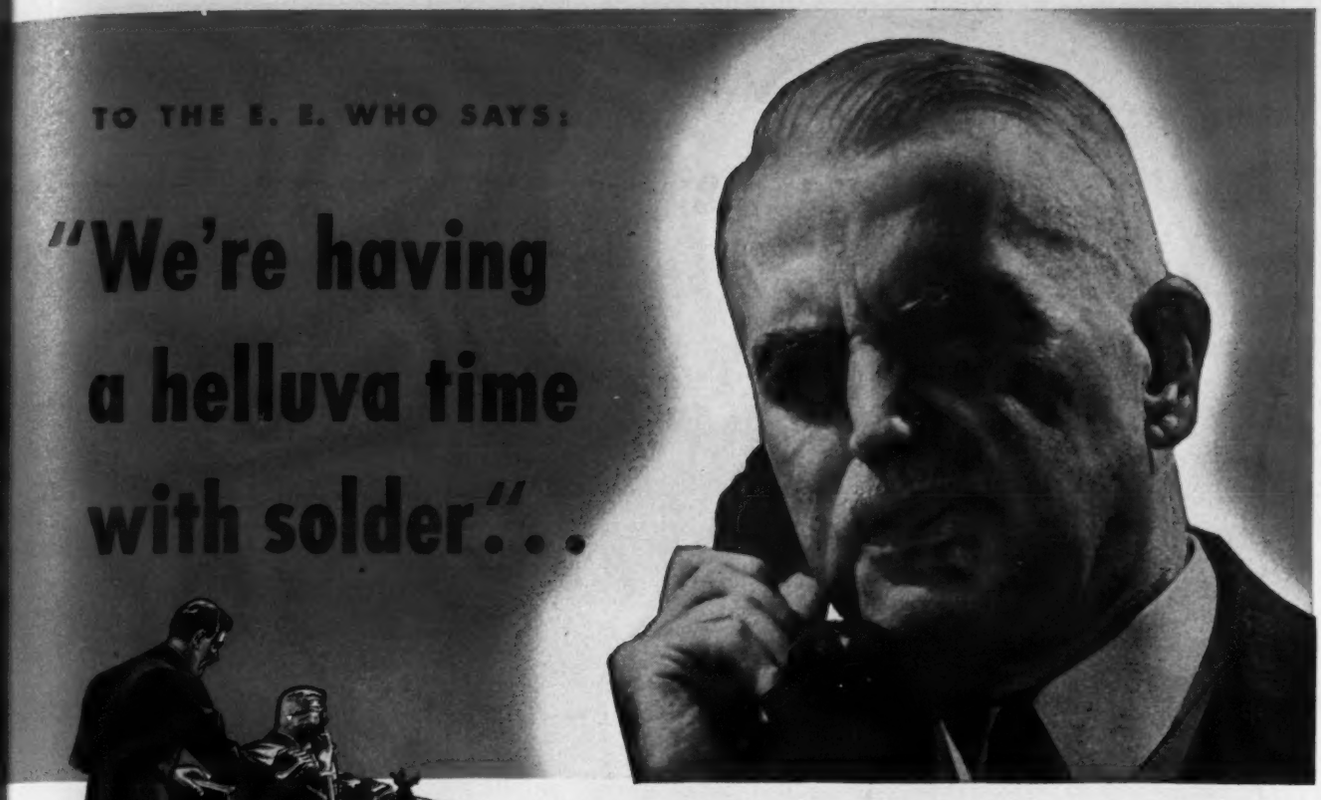
We would like you to know the Gould men who will take care of your industrial storage battery requirements.

The West Coast states are served by a group of men working under the direction of Mr. R. P. Anderson, Sales and Service Manager at 2678 Lacy Street, Los Angeles. At San Francisco, Mr. J. H. Hamilton is located in the Flood Building. Mr. F. J. Smith is at 1233 N.W. Lovejoy St., Portland, and Mr. N. R. Farsje headquarters at W. 508 29th St., Spokane, Wash.

(Advertisement)

TO THE E. E. WHO SAYS:

"We're having a helluva time with solder"...



BURNDY SAYS: "Stop Worrying!

YOU DON'T NEED A DROP OF SOLDER TO MAKE A GOOD JOINT!"

3 from thousands

of Burndy Solderless Connectors

Hylug—Type YAG (indent type)

Servit—Type KS

Qiklug—Type QA-8

Burndy left the solder pot behind over 20 years ago—and the millions of sound Burndy *solderless* connectors since put in service under every conceivable operating condition prove what a great step forward this was!

For tiny wire connections, or for the largest conductor connections for heavy current loads, Burndy *solderless* connectors replace the messy, time-wasting solder pot with simple clamping elements . . . providing SPEED and EASE and a BETTER ELECTRICAL CONNECTION.

Whatever connector problem may be bothering you today, Burndy has either solved it in 20 years of specialized engineering in this field—or will solve it for you now, with a connector custom-made to fit your needs. Call in a Burndy representative. If he can't show you time and cost savings decidedly worth-while, invite him to go fly a kite!

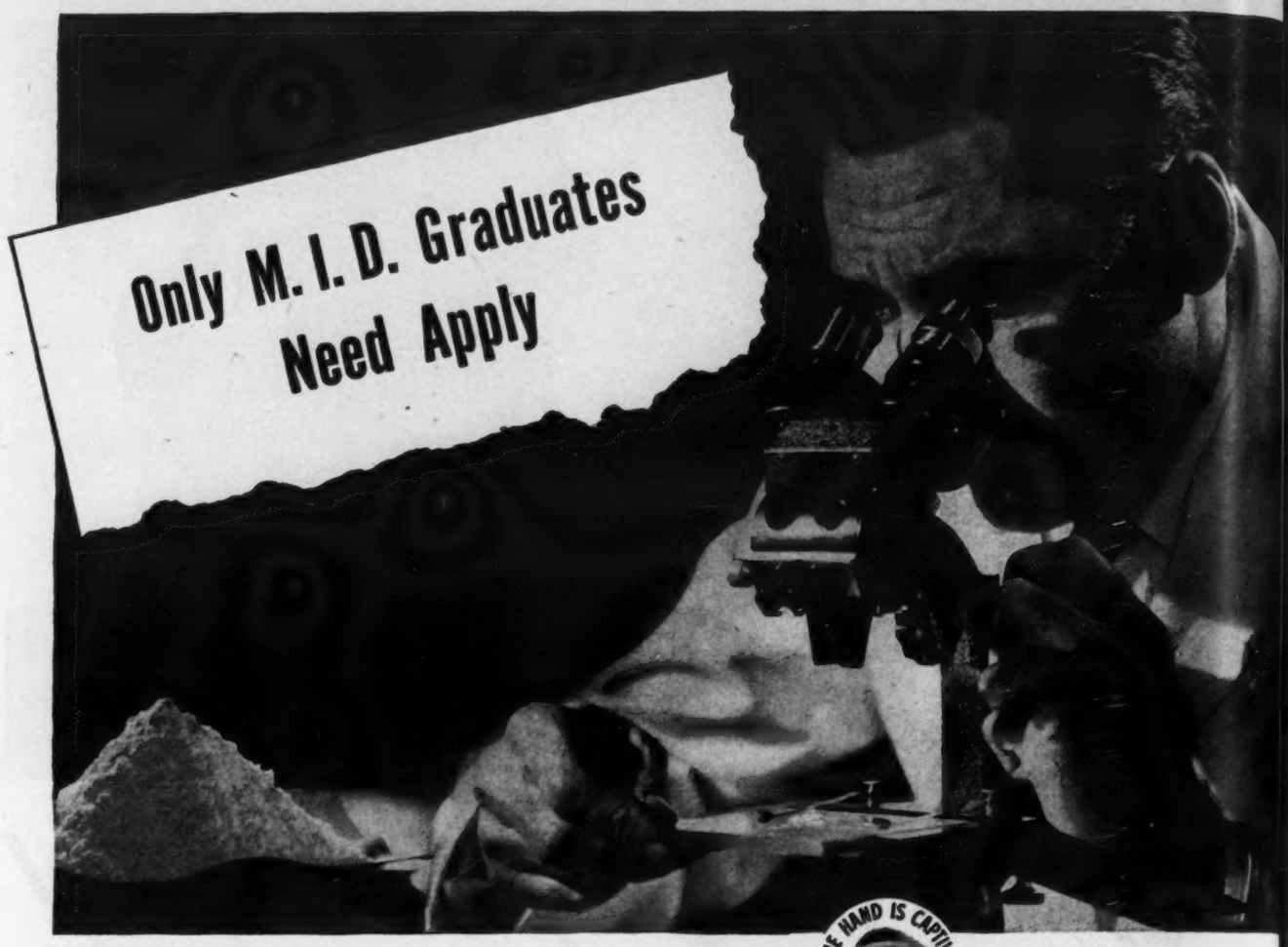
Headquarters for connectors

Burndy

The Answer TO YOUR ELECTRICAL CONNECTION PROBLEM

OVERHEAD • UNDERGROUND • POWER • WIRING • GROUNDING

BURNDY ENGINEERING CO., INC. • 107 EASTERN BOULEVARD, NEW YORK CITY



THE HAND IS CAPTIVE TO THE EYE

● M.I.D. — Material Inspection Department — is the first of many watchdogs that guard the quality of Sylvania Fluorescent Lamps. Before graduation from M.I.D. all materials must pass tough electrical, mechanical, chemical and visual tests.

Here an M.I.D. inspector is checking the quality of hair-fine tungsten, with a microscope, before it is released for fabrication into fluorescent cathodes.

The same painstaking care oversees each step of precision manufacture. When a finished Sylvania Fluorescent Lamp is ready for shipment to the war production front, it has to answer 49 quality questions. To pass this postgraduate course, it has to be the finest in fluorescent.

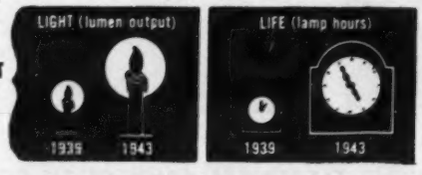
But the Sylvania standard of quality is not frozen into production. There are constant specification and processing changes. Many of them, like the "Mercury Bomb" method of ultra-precise measurement, conserve metals and man power, but all of them serve to step up fluorescent performance.

Research results are more lumens per watt, longer life, a finer coating and more uniform light color. These are the good reasons why Sylvania Fluorescent Lamps can be specified, with full confidence, for replacements and for new installations authorized to promote visual efficiency in war plants.

SELL SYLVANIA AND GIVE YOUR CUSTOMERS FAR MORE LIGHT AND LIFE FOR THEIR MONEY

Compared with 1939, a dollar invested today in Sylvania Fluorescent Lamps buys more than four times the lumen output and approximately five times the lamp life.

SYLVANIA FLUORESCENT DOLLAR BUYS:



(Based on decreasing price and increasing efficiency and durability of Sylvania 40-Watt White Fluorescent Lamp)

SYLVANIA

ELECTRIC PRODUCTS INC.

Formerly Hygrade Sylvania Corporation
Salem, Mass.

INCANDESCENT LAMPS, FLUORESCENT LAMPS, FIXTURES AND ACCESSORIES, RADIO TUBES, CATHODE RAY TUBES, ELECTRONIC DEVICES

Less Absenteeism

N MOTOR OPERATION

WHEN THE Monitor
THERMALOAD V
SOLENOID STARTER
UARDS AGAINST EXCESSIVE OVERLOAD

he Monitor Thermaload V Solenoid Starter is designed play an important part in "Production for Victory". or this proved-superior starter gives positive protection gainst breakdowns and premature motor wear due to xcessive overload. No matter where your motors operate . . . in numbing cold or tropic heat . . . you can be sure at the Thermaload V will function efficiently, add life to our motors, reduce your maintenance costs and provide n effective safeguard against work schedule interruption.

pecify Monitor Thermaload V Solenoid Starters for orig- al equipment and for replacement. They are available OW—from stock—subject, of course, to existing pri- rity regulations. See your Monitor field engineer or write r shipping data, technical and installation details.

Available for 1.5 to 7.5 H. P. —110 to 550 Volts (A.C.) Also in combination units.

PERFORMANCE-MINDED DESIGN

1 EXCLUSIVE MONITOR COMPENSATED OVERLOAD RELAY

2 TAMPER-PROOF PROTECTION

3 VERTICAL STRAIGHT-LINE DESIGN

4 DOUBLE-BREAK, SILVER CONTACTS

5 INTERCHANGEABLE COILS

6 RESILIENT, SHOCK-PROOF MOUNTING

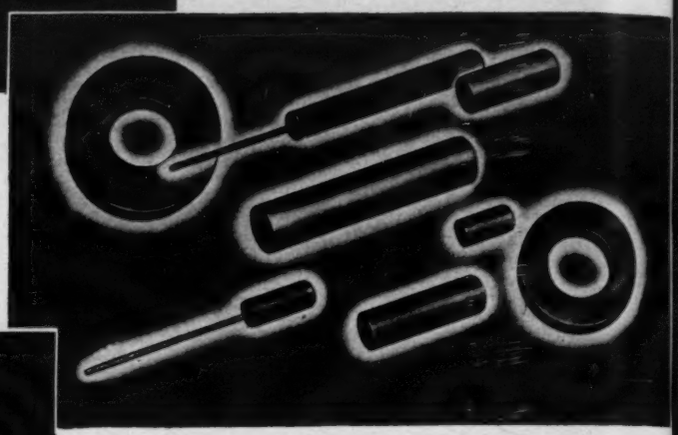
TheMonitorControllerCompany

GAY, LOMBARD & FREDERICK STS. BALTIMORE-2, MARYLAND

MOLDED CARBONS, GRAPHITES, METALS and COMPOSITIONS

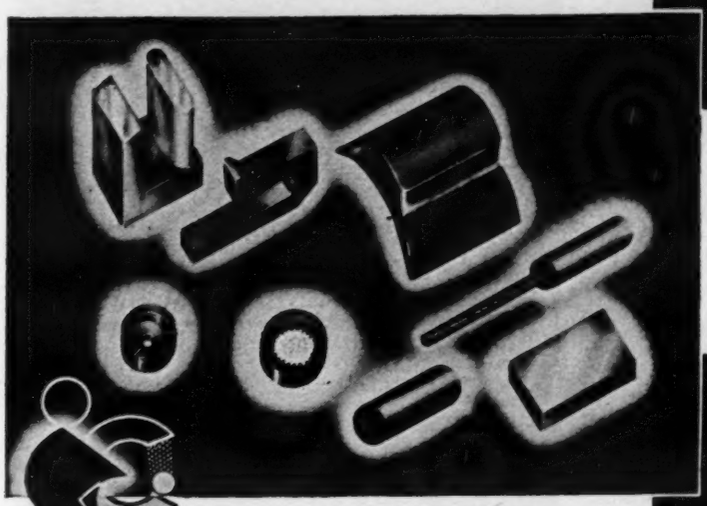
BRUSHES

From the latest, most dependable high-altitude brushes to standard and special types for all rotating electrical equipment, Stackpole produces a complete line for original equipment manufacturers. Stackpole engineers are in constant touch with brush problems and will gladly make recommendations based on this broad, highly-specialized experience.



IRON CORES

Recent Stackpole developments include molded Iron Cores for radio equipment operating at frequencies as high as 175 megacycles. Other Stackpole Iron Cores are available in a variety of grades and sizes for frequencies up to 50 megacycles. Molded from metal powders to match your specifications.



POWDER METALLURGY

Stackpole's specialization in molded products has resulted in important progress in the field of molding solids from powdered iron, iron-nickel, and other metal powders. Few recent developments hold such great promise to so many industries as a source of easier-to-obtain, accurate, yet less costly components.

CONTACTS

Stackpole offers suitable contacts for almost every application—from the various silver compositions to dozens of special alloys. Equally important is the Stackpole engineering service that not only helps you select the right contacts, but, if necessary, adapt your equipment to utilize them most efficiently.

Other Stackpole Products
Bearings • Anodes • Electrodes • Battery Carbons • Packing, Piston, and Seal Rings • Brake Lining, etc., etc.

Electronic Components
Fixed and Variable Resistors • Iron Cores • Line Switches, etc.

STACKPOLE

STACKPOLE CARBON COMPANY, St. Marys, Pa.

NEW FIRE-KILLING POWER FOR DUGAS

DuGas, well known for its fast action in extinguishing difficult fires, now makes an important new contribution to fire protection. Research has resulted in the development of a new PLUS-FIFTY duGas Dry Chemical with increased fire-fighting effectiveness when applied from duGas pressure-type dry chemical extinguishers. This new, faster action is obtained without sacrificing any of the distinctive advantages of the former duGas.

NEW PLUS-FIFTY duGas DRY CHEMICAL

production, PLUS-FIFTY duGas is available without priority for refill purposes. . . and there is no advance in price.

APPROVED by the Underwriters' Laboratories and the Factory Mutual Laboratories.

AVAILABLE in Models 15 and 30 Hand Extinguishers, Models 150 and 350 Wheeled Extinguishers.

. . . WRITE FOR COMPLETE BULLETIN ON NEW PLUS-FIFTY DUGAS and Priority Information on Extinguishing Equipment.

Proven by Hundreds of Practical Fire Tests

t retains the long-range effectiveness of the stream hich permits the operator to knock down fire from a reater distance. It hangs in a cloud over the fire, proiding greater smothering action and reducing flashacks. Like the former duGas, PLUS-FIFTY duGas ill not cake, harden, evaporate, deteriorate or freeze. t generates no toxic fumes and is not an electrical onductor. Since no critical materials are used in its

Model 150 Wheeled Extinguisher

WRITE FOR

Chart showing characteristics of *all* types of approved hand fire extinguishers.

DUGAS ENGINEERING CORPORATION

OWNED AND OPERATED BY

ANSUL CHEMICAL COMPANY, MARINETTE, WISCONSIN

New Gulf Coast State Utility Plant of Outdoor Type Is Equipped with Ljungstrom Preheater

Here's a boiler plant in which fuel savings are backed up by sound conservation of steel and other structural materials. Designed for natural gas firing, it has a maximum continuous rating of 425,000 lb steam per hr. Operating pressure is 900 lb per sq in. Gases enter the preheater at 775 deg F, leave at 370, and heat the combustion air to 632 degrees. Preheater and fan assembly are installed out in the open between the steam generator and stack.

• • • • •

Ljungstrom Air Preheaters save fuel two ways. First, they recover heat that would otherwise be lost up the stack, increasing efficiency of the plant by 6 to 10 percent. Second, they provide more effective combustion conditions, a factor of particular importance in burning lean fuels. In some cases, preheating of combustion air makes it possible to use fuels that would otherwise be unsatisfactory.

At the same time, this compact *regenerative* type of preheater saves appreciably on steel and construction materials. First, because optimum heat recovery is obtained with *one-half* to *one-third* the weight of steel in the preheater itself, as compared to other types. Second, because lower weight and compact design permits a simple supporting structure.

Today, the *conservation* features of the Ljungstrom are expanding its application from high-efficiency boiler plants to a wide range of industrial applications where gas-to-air heat transfer can save fuel and improve combustion. These applications include oil heaters, metallurgical furnaces, and the like.

For the complete story on the operating principle and construction features of the Ljungstrom Air Preheater, write for a copy of Bulletin S-1.

For PRODUCTION ACHIEVEMENT...

The U. S. Maritime Commission has awarded its "M" Pennant and Victory Fleet Flag to the men and women of Air Preheater Corporation.

THE

AIR PREHEATER

CORPORATION

Executive Offices: 60 East 42nd Street, New York 17, N. Y. • Plant: Wellsville, New York

7 FEATURES OF SKF PERFORMANCE
on Fairbank-Morse Motors

Built by FAIRBANKS, MORSE & CO.

More than 25 years ago, Fairbanks, Morse & Co., developed a line of general purpose SKF-equipped motors. Today, they list these seven advantages.

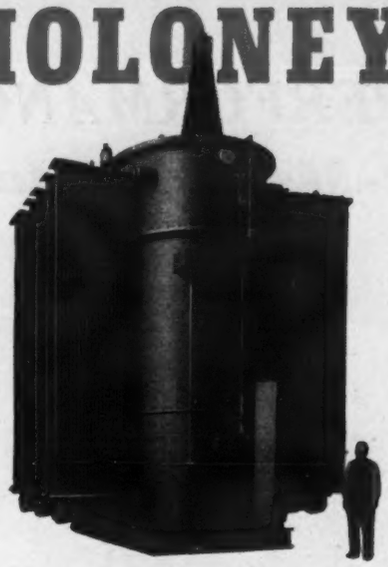
- *BEARING WEAR equally distributed and almost imperceptible even in severe service over long periods of time.*
- *MINIMUM BEARING MAINTENANCE—lubricant requires replacement only once a year in normal eight-hour day operation.*
- *MEASURED LUBRICATION—specially designed individual grease tubes for lubricating F-M ball bearing motors.*
- *EXPENSIVE SHUTDOWNS AVOIDED—ball bearings do not burn out and seize the shaft.*
- *CLEAN MOTORS AND SURROUNDINGS—oil eliminated as a lubricant; grease-tight ball bearing enclosures.*
- *REPLACEMENT OF SCORED SHAFTS UNNECESSARY—shaft wear eliminated—all wear distributed equally between inner and outer ball bearing races.*
- *HIGH OPERATING EFFICIENCY—maintenance of a uniform air gap between the rotor and the stator, together with a minimum of friction loss, assures sustained high overall operating economy.*

5303

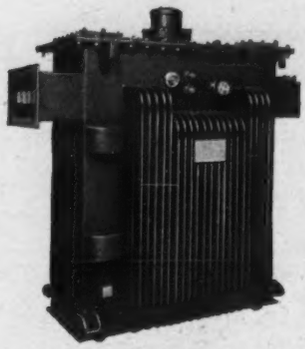
SKF INDUSTRIES, INC., PHILA., PA.

Tips
ON BEARING CARE
To make present equipment last longer
1. Use clean lubricant recommended by the manufacturer of this machine.
2. Avoid loads and speeds beyond those recommended by the manufacturer.
3. If necessary to remove bearings, keep them properly lubricated. Avoid the intrusion of water and dirt. Apply pressure on the inner race only. Don't hammer outer race.
SKF
BALL AND ROLLER
BEARINGS

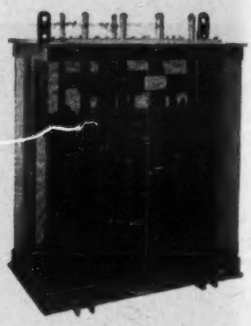
MOLONEY TRANSFORMERS



Moloney Power Transformer. Transformer pictured above is rated 25,000 Kva, 161,000Y to 13,200 volts. These transformers can be supplied in any capacity or voltage desired.



Moloney Askarel (non-inflammable liquid cooled) Transformer. For indoor installation at load centers without the use of fire-proof vaults. Available in all Kva and voltage ratings.



Moloney Air-Cooled Transformer with Class B insulation. For indoor installation at load centers without the use of fire-proof vaults. Available in voltages up to 13,800 volts and in capacities of 150 Kva and larger.

One of these MOLONEY transformers will meet your requirements . . .

Moloney manufactures transformers for all types of installations. If transformers of standard design do not fill your needs, our experienced engineering staff can design transformers which will exactly fit your requirements.

Disconnect switches, oil-fused cutouts, terminal boxes with potheads, forced-air-cooling, secondary air circuit breakers and many other features can be supplied on Moloney transformers.

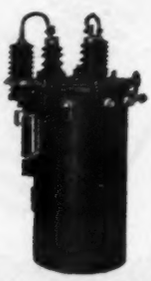
Quick shipment can be effected whether the transformers are of standard or special design. Your inquiries will be given prompt attention.

MOLONEY ELECTRIC COMPANY
ST. LOUIS, U. S. A.

Moloney Transformers for every purpose

- Power Transformers
- Unit Substations
- Conventional Distribution Transformers
- Completely Self-Protected (CSP) Transformers
- Load Center Transformers
- Askarel (non-inflammable liquid) Cooled Transformers
- Air-cooled (Class A and Class B insulated) Transformers
- Constant Current Street Lighting Transformers
- Vault Type Transformers
- Submersible Type Transformers
- Furnace Transformers
- Shipboard Transformers
- Industrial Transformers
- Network Transformers

Moloney Conventional Distribution Transformer, oil-cooled, for outdoor pole or platform mounting. Sizes 1½ Kva to 500 Kva. Voltages up to 66,000 volts. Illustration typical of sizes 75 and 100 Kva, 7200 to 120/240 volts.



Moloney Completely Self-Protected Transformer, oil-cooled, equipped with built-in lightning and secondary overload protection. Sizes 1½ to 50 Kva. Voltages 2400 to 13,800 volts. Illustration typical of sizes 1½ to 25 Kva, 7200 to 120/240 volts.

Moloney General Purpose Air-Cooled Transformers with Class A insulation. For industrial use to serve lighting and small power loads. Left illustration typical of sizes 15 to 50 Kva. Right illustration typical of sizes 1 Kva to 10 Kva. Voltages 600, 480 or 240 to 120/240 volts.

COOL CABLES CARRY MORE *Current*

Heat — too much heat — is not good for cable insulation. It causes rapid deterioration and eventually will destroy the cable. Just now cables must carry extra heavy loads and are frequently overloaded to a point where they run excessively hot for long periods of time. If ways and means can be provided for heat control and dissipation, future trouble can be averted and interference with service avoided.

Rerouting cables to avoid warm locations will give them a better chance, forced ventilation to carry heat out of conduits and manholes will reduce the heat hazard, wetting soil around underground cables will aid dissipation of excess heat, opening up close groups of cables will provide better ventilation and cooler operation, external heat can be avoided by relocation of either the cable or the source of heat.

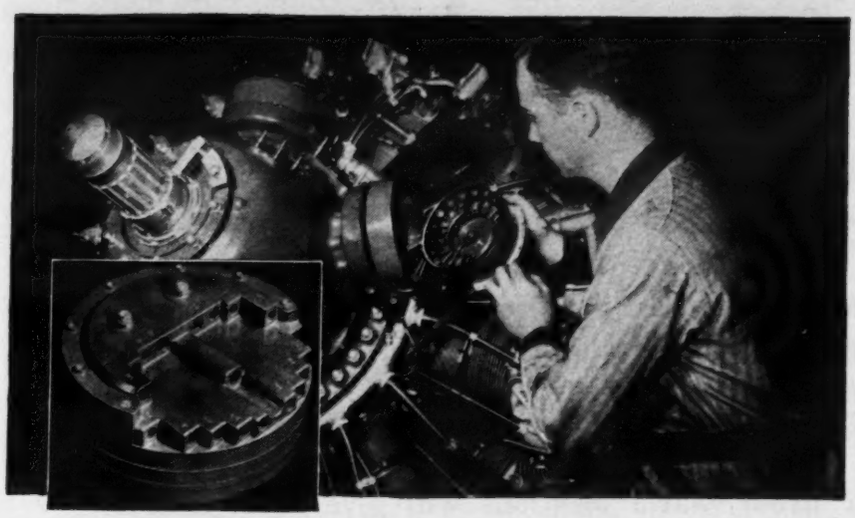
Any reduction of heat in or around a cable will increase current carrying capacity and give more efficient operation. It means more satisfactory service from the cables you have, postponement of replacements and conservation of copper and other scarce materials of which cables are made.

Simplex Wire & Cable Co., 79 Sidney Street, Cambridge 39, Mass.

Simplex

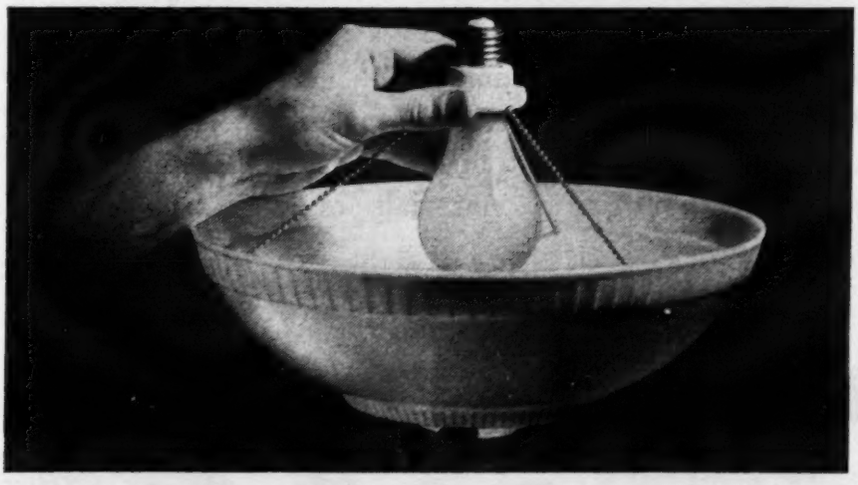
WIRES and CABLES

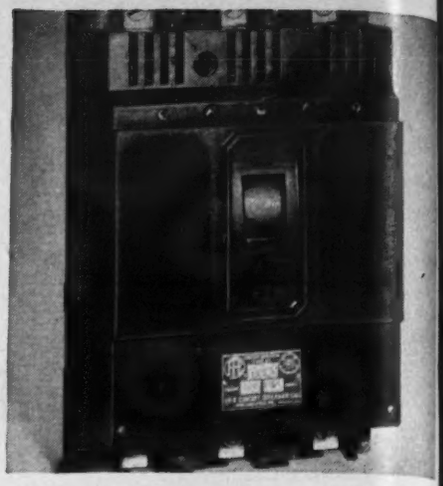
LIFE ON THE PLASTICS NEWSFRONT



(*Above*) **TO CONTROL THE TREMENDOUS PULSE** of the 18-cylinder radial aircraft engines built by the Ford Motor Company, distributors must have dielectric strength, high arc resistance and heat resistance. To obtain these and other important properties, Ford designed and molds the distributor housings out of MELMAC®.

(*Below*) **FROM OLD-FASHIONED TO MODERN IN A MINUTE** is the story with overhead sockets when BEETLE® adapter-type bowls are used. Well suited for postwar remodernization, they are lightweight, shatter-resistant, electrically insulating and provide high light transmission. Such properties make BEETLE popular for many other lighting uses.





(*Above*) **ARC RESISTANCE** coupled with high di electric strength and heat resistance are among the reasons why MELMAC 3020 is used for such electrical parts as this one made by the I-T-E Circuit Breaker Company. A third type of MELMAC developed by Cyanamid, it is chopped-cotton-fabric-filled for high strength.

(*Below*) **STAIN RESISTANCE** and freedom from odor and taste are among the characteristics of MELMAC 1077—an alpha-cellulose-filled molding material used in making the shatter-resistant top chamber of this dual-unit Vaculator, designed and built for the U. S. Navy by the Hill-Shaw Company.

TRANSLUCENT BEETLE IDEAL FOR POSTWAR LIGHTING

Light weight, shatter-resistance, high light transmission, excellent diffusion characteristics and durability combine to make translucent BEETLE ideal for postwar lighting fixtures and reflectors.

Typical Properties of BEETLE

Weight about 1/3 as much as a similar reflector made of glass.

It provides efficient lighting and illumination which is easy on the eyes. Reflectors with an efficiency of 87% are produced from BEETLE material, and have a surface brightness of less than 2-candle power per square inch.

AMERICAN CYANAMID COMPANY · PLASTICS DIVISION · 30 ROCKEFELLER PLAZA, NEW YORK 20, N. Y.

CYANAMID PLASTICS

BEETLE · MELMAC · URAC · MELURAC · LAMINAC

a Long Life

AND A USEFUL ONE

On the job doing their duty all the time—that's the reputation of Tobe Capacitors, earned through an almost complete absence of "returns!"

This record, far from making Tobe engineers complacent, acts as a spur to even higher quality, through constant research in materials and methods. Each Tobe Capacitor continues to be rated with ultra-conservatism.

The Tobe Oil-Mite Capacitor, shown here, is impregnated and filled with mineral oil. It is performing day-in, day-out duty as a filter condenser in war equipment. Inquiries in connection with your condenser problems will receive our prompt attention.

LONG LIFE ASSURED

Note new hold-down bracket that allows inverted or upright terminals. Takes less space and permits wiring either underneath or on top of chassis.

CHARACTERISTICS OF TOBE OIL-MITE CAPACITORS

STANDARD CAPACITY TOLERANCE.	±10%
TEST VOLTAGE	Twice D.C. rating
SHUNT RESISTANCE	.05 to 0.1 mfd. 20,000 megohms. .25 to 0.5 mfd. 12,000 megohms. 1.0 to 2.0 mfd. 12,000 megohms
RATINGS	.05 mfd. to 2.0 mfd. 600 V.D.C. .05 mfd. to 1.0 mfd. 1,000 V.D.C.
GROUND TEST	2,500 Volts D.C.
POWER FACTOR	At 1,000 cycles—.002 to .005

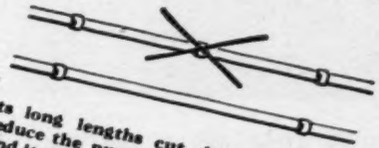
TOBE DEUTSCHMANN CORP. TOBE CANTON · MASSACHUSETTS

A SMALL PART IN VICTORY TODAY—A BIG PART IN INDUSTRY TOMORROW

WHAT'S THE DIFFERENCE BETWEEN TRANSITE *CONDUIT* and TRANSITE *KORDUCT*?

TRANSITE KORDUCT

is ideal for locations where ducts must be "concreted in." It is identical with Transite Conduit, except that it is thinner walled and lower priced. It saves at installation because . . .



its long lengths cut down on joints, reduce the number of spacers required. And its high rate of heat dissipation cuts cable operating temperatures . . . increases system capacity.

TRANSITE CONDUIT

is for use underground or on exposed locations without a concrete casing. It can't rust or rot . . . resists weather and corrosion . . . remains unaffected by smoke or ordinary fumes . . .

Its uniform strength and durability mean that it holds its true form under earth loads and traffic pressure. And it is low in cost . . . more economical in service than other materials of comparable strength and corrosion-resistance.

And here are characteristics that Transite Conduit and Transite Korduct have in common . . .

1. Incombustible . . . Made of asbestos and cement, Transite Ducts won't contribute to the formation of dangerous smoke, gases or fumes. When burnouts occur, they give maximum protection to adjacent cables and equipment.

2. Immune to Electrolysis . . . Transite Ducts are entirely inorganic, non-metallic, cannot be affected by electrolysis.

3. Smooth bore . . . Cable pulls and replacements are easier . . . damage to sheathings is minimized.

4. Easily installed . . . Their combination of light weight, long lengths and quickly assembled couplings speeds up work.

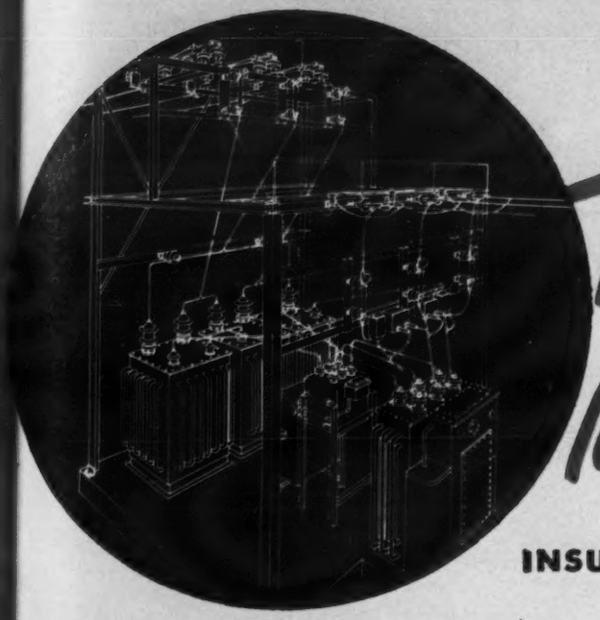
For details and specifications, write for Data Book DS-410. Address Johns-Manville, 22 East 40th Street, New York, 16.

JM Johns-Manville

TRANSITE DUCTS

TRANSITE KORDUCT— for installation in concrete

TRANSITE CONDUIT— for exposed work and installation underground without a concrete encasement



To reduce outages.. localize breakdowns

SPECIFY WESTINGHOUSE APPARATUS

INSULATORS FOR THE ENTIRE SUBSTATION

FROM 7½KV TO 287KV WESTINGHOUSE APPARATUS INSULATORS MEET EEI AND NEMA BASIC INSULATION LEVEL STANDARDS

69 kv Insulator

Withstand Impulse Voltage: 350 kv with 1½ x 40 microsecond positive wave.

Dry Voltage: 175 kv, 60 cycle, 1 minute withstand.

Wet Voltage: 145 kv, 60 cycle, 10 second withstand.

Radio Noise Influence Voltage: 200 microvolts at 44 kv test voltage to ground.

46 kv Insulator

Withstand Impulse Voltage: 200 kv with 1½ x 40 microsecond positive wave.

Dry Voltage: 120 kv, 60 cycle, 1 minute withstand.

Wet Voltage: 100 kv, 60 cycle, 10 second withstand.

Radio Noise Influence Voltage: 200 microvolts at 30 kv test voltage to ground.

Today's substation installations have an important job to do. There's no time for service outages because of unexpected insulator failure.

That's why we say, "Specify Westinghouse B.I.L. Standard Apparatus Insulators."

- The line is *complete,* ranging all the way from 7½ kv to 287 kv capacity.
- Each insulator conforms to EEI and NEMA "Basic Insulation Level" standards.
- Each insulator can be depended upon to provide a predetermined basic insulation level.

With these advantages, you can co-ordinate your entire substation at the correct insulation level. You can design your system to reduce outages, and—if electrical breakdown from lightning occurs—localize it at a point where the least damage will result to apparatus and service.

Next time you order outdoor apparatus insulators, specify Westinghouse porcelain. Westinghouse Elec. & Mfg. Co., East Pittsburgh, Pa. Factories at Derry, Pa., and Emeryville, Calif. J-05137

PLUS R.I.P. at no extra cost

R.I.P. stands for Radio-Interference-Proof—the simple permanent answer to all problems of insulator-generated radio noise. All Westinghouse Outdoor Switch and Bus Insulators, including the new units, are Radio-Interference-Proof.

7½ kv Insulator

Withstand Impulse Voltage: 85 kv with 1½ x 40 microsecond positive wave.

Dry Voltage: 35 kv, 60 cycle, 1 minute withstand.

Wet Voltage: 30 kv, 60 cycle, 10 second withstand.

Radio Noise Influence Voltage: 50 microvolts at 5 kv test voltage to ground.

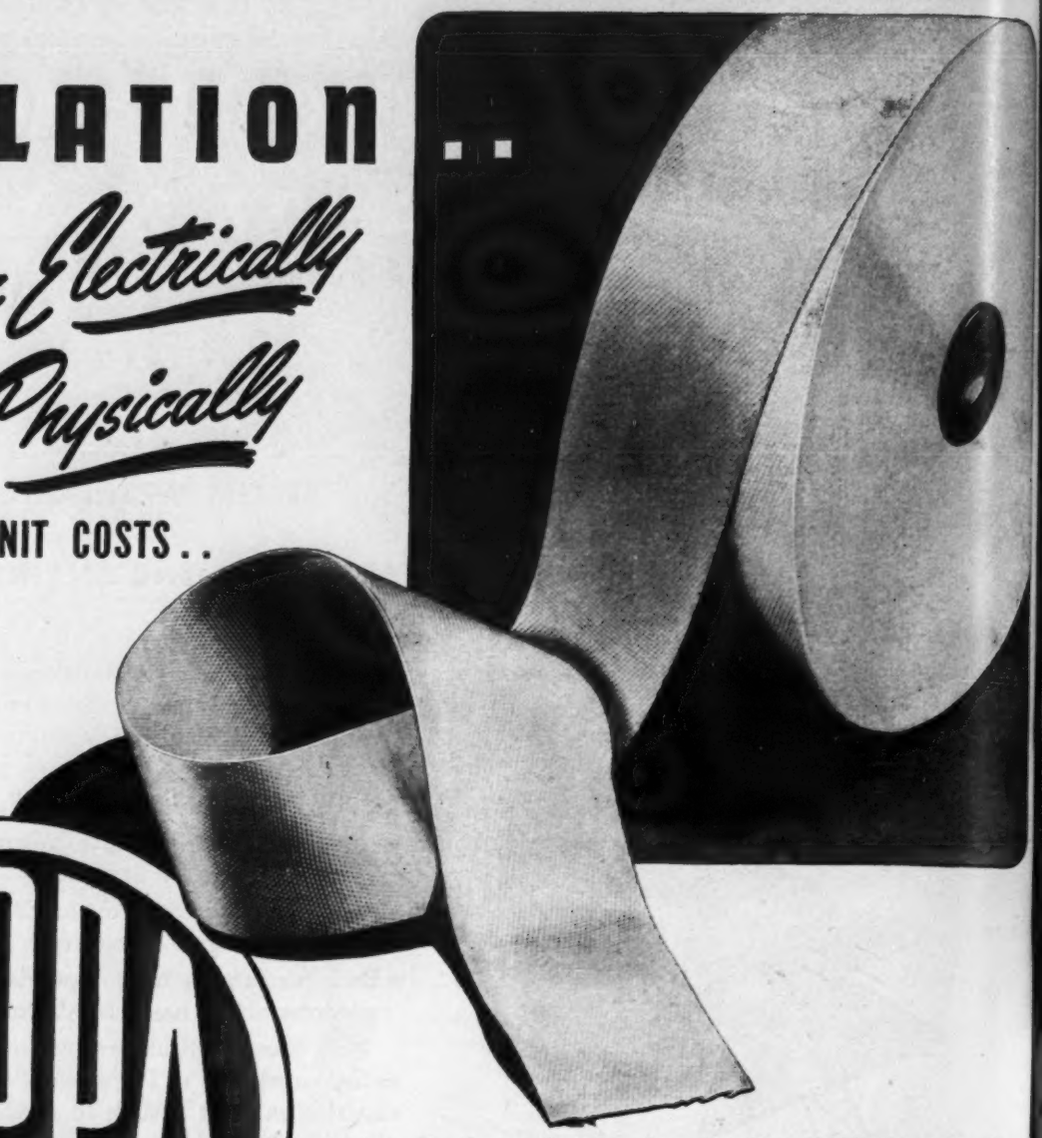
Westinghouse PORCELAIN

PLANTS IN 25 CITIES... OFFICES EVERYWHERE

INSULATION . .

Superior Electrically and Physically

AT LOWER UNIT COSTS . .



KAPPA

Trade Mark Reg. U. S. Pat. Off.

CELLULOSE - ACETATE RAYON

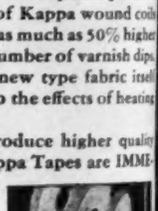
COIL-WINDING TAPES

Two facts stand out from the results of impartial laboratory tests of Kappa Cellulose Acetate Rayon Tapes and have been confirmed by the experience of leading electrical manufacturers who have used this new and superior product.

First, that the electrical qualities and performance of Kappa wound coils are better...dielectric breakdown of tested samples being as much as 50% higher than for standard coil winding materials with the same number of varnish dips.

Second, that the inherent good qualities of the new type fabric itself promise finished insulations that will be more resistant to the effects of heating and aging with consequent longer coil life.

Kappa Tape advantages can today help you to produce higher quality windings with economy in material and varnishing. Kappa Tapes are IMMEDIATELY AVAILABLE in standand widths and consistent mil thicknesses. Write for long length test samples and copy of the KAPPA TECHNICAL BULLETIN containing detailed resultsof all tests. Wm. E. Wright & Sons Co,. Industrial Textile Division, Box 1000, West Warren, Mass.

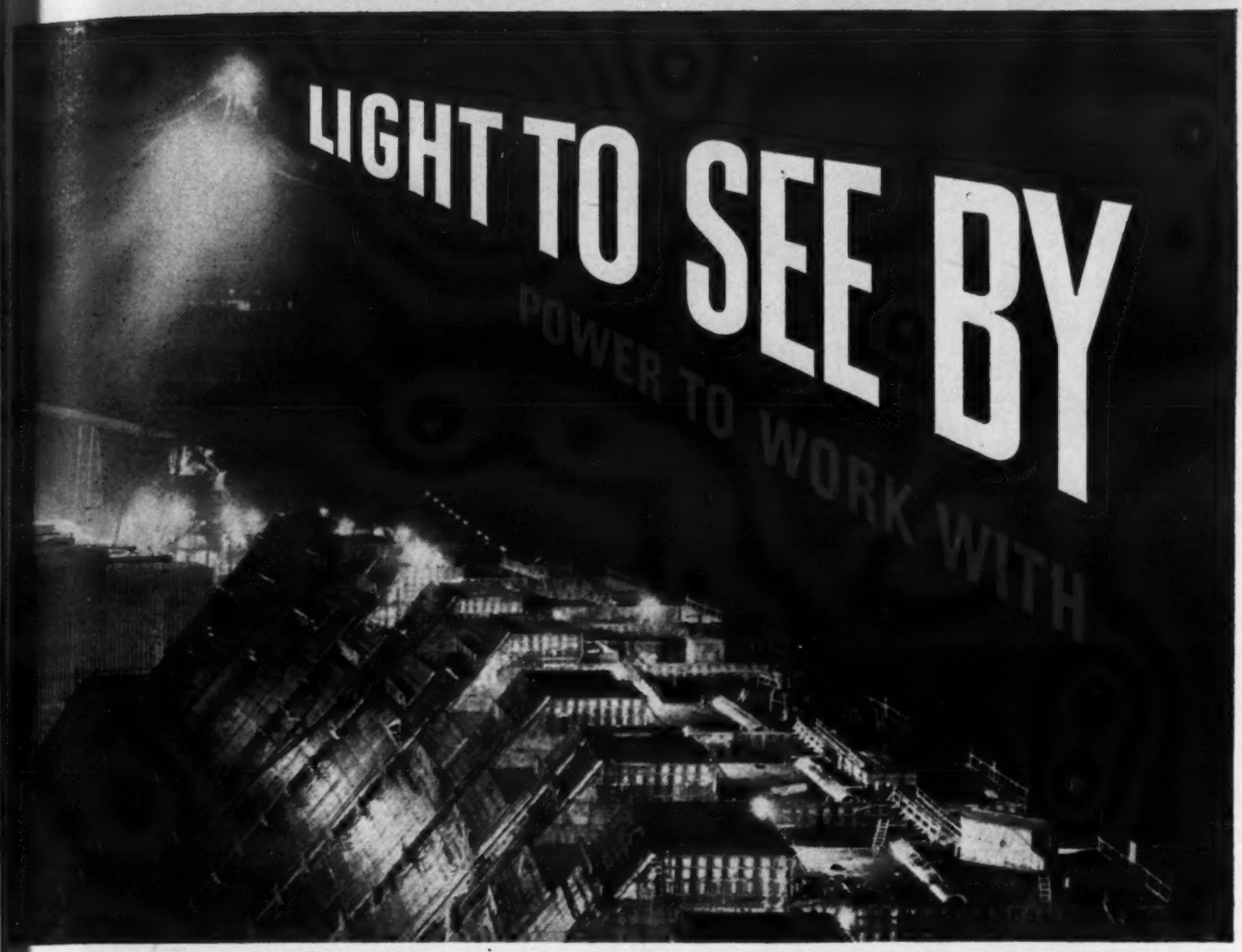


Complete test and Technical Data and pra... in this new Bulleti... free on request.

- **COMPLETE IMPREGNATION**
- **HIGHER DIELECTRIC**
- **LESS VARNISH BUILD-UP**
- **FEWER VARNISH DIPS**
- **SUPERIOR FINISH**

KAPPA

The Wright tape for every winding . .



TURNING night into day with flood lights makes possible 24-hour operation at the giant Shasta Dam in the Sacramento Valley, California. Supplying electric light and power not only for construction jobs, but to shipyards, railroad yards, shops, mills and factories throughout all industry, is one vital wartime job of the public utilities.

To supply the nation's constantly growing demand for light and power requires that the industry's turbo-generators be maintained at peak output . . . and to assure this, prominent central stations everywhere are lubricating their turbines with *Texaco Regal Oil*. *Texaco Regal Oils* keep turbine lubrication systems clean, assuring normal bearing temperatures and smooth, sensitive governor action. These oils rapidly free themselves from air and water, and are highly resistant to emulsification, gum formation, sludging. They are rust and oxidation inhibited.

So effective have Texaco lubricants proved that they are definitely preferred in the various fields listed in the panel.

A Texaco Lubrication Engineer will gladly cooperate in the selection of the most suitable lubricants for your equipment. Just phone the nearest of more than 2300 Texaco distributing points in the 48 States, or write:

☆ ☆ ☆

The Texas Company, 135 East 42nd Street, New York 17, N. Y.

THEY PREFER TEXACO

★ More locomotives and railroad cars in the U. S. are lubricated with Texaco than with any other brand.

★ More revenue airline miles in the U. S. are flown with Texaco than with any other brand.

★ More buses, more bus lines and more bus-miles are lubricated and fueled with Texaco than with any other brand.

★ More stationary Diesel horsepower in the U. S. is lubricated with Texaco than with any other brand.

★ More Diesel horsepower on streamlined trains in the U. S. is lubricated with Texaco than with all other brands combined.

TEXACO

TEXACO Regal Oils
FOR ALL TURBINES

TUNE IN THE TEXACO STAR THEATRE EVERY SUNDAY NIGHT — CBS ★ HELP WIN THE WAR BY RETURNING EMPTY DRUMS PROMPTLY

Why doesn't somebody do something?

. . . or don't they know any better

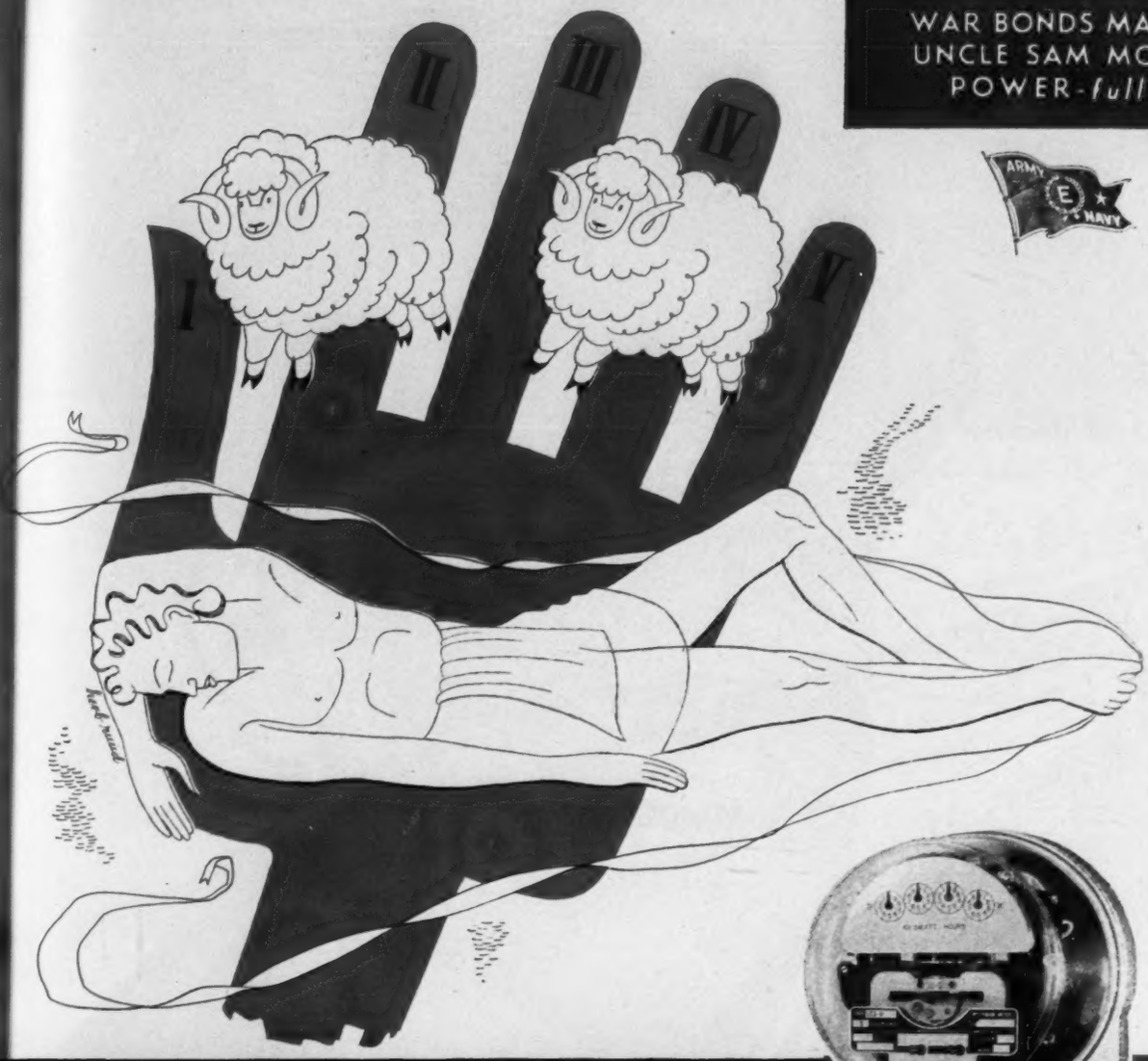
A sudden blaze calls for fast action . . . grab an ex guisher . . . hit the fire in a hurry.

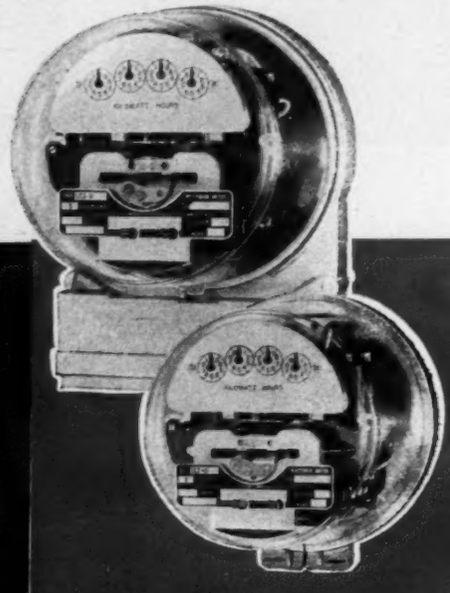
Yet it takes "know how." Your men must know how pick the *right* extinguisher, must know how to handle *Have you taught them these simple, important facts?*

Demonstrations do this teaching job best. Show y employees real fires, with real extinguishers in action. series of well-run demonstrations may help save your pl if fire breaks out.

So Walter Kidde & Company have prepared "How Teach Fire-Fighting." It tells how to make these demons tions most effective. Write for your plant's copy. It's f of course. Walter Kidde & Company, Inc., 925 M Street, Belleville, N. J.

WAR BONDS MAKE
UNCLE SAM MORE
POWER-*full*





"On Measurement is founded the whole progress of man.."

In counting, the Romans used units of five based on the fingers of the hand. They would mark I "one", II "two", III "three", IIII "four", and to show a "tally", the fifth mark was diagonal, forming a V. So V meant five; X meant double V, or ten. Counting sheep was the test of accuracy. If the counter bent his head to mark a "tally", many quick little sheep could dart past; if he attempted to memorize the "tallies", he became so drowsy that whole units were often forgotten. Yet, that was the conception of accurate measurement. Compare it with today's high standard of measurement of electricity set and met by the electric utilities and the manufacturers of watthour meters.

NO OTHER COMMODITY IS MEASURED SO *Accurately* AS ELECTRIC POWER

● SANGAMO ELECTRIC COMPANY SPRINGFIELD ILLINOIS ●

Joe needs the Long Distance lines tonight

He has a promotion to report. Or a week-end leave coming up. Or it's his mother's birthday.

Evening is about the only time he's free to call and it's important to him.

Will you do your best to avoid Long Distance calls after 7 at night, for the sake of millions of Joes — and Josephines? They'll appreciate it.

BELL TELEPHONE SYSTEM

If that wiring is ALUMINUM the weight is about half

Couple the high conductivity of aluminum and its light weight, and you have an ideal combination for power conductors for use in airplane construction.

The larger military airplanes being developed have need for cables having these properties. Many of their electrical circuits must carry heavy currents. Aluminum will handle that job and it will save a lot of weight. It can be fabricated as flat, round and tubular bus, and stranded cable.

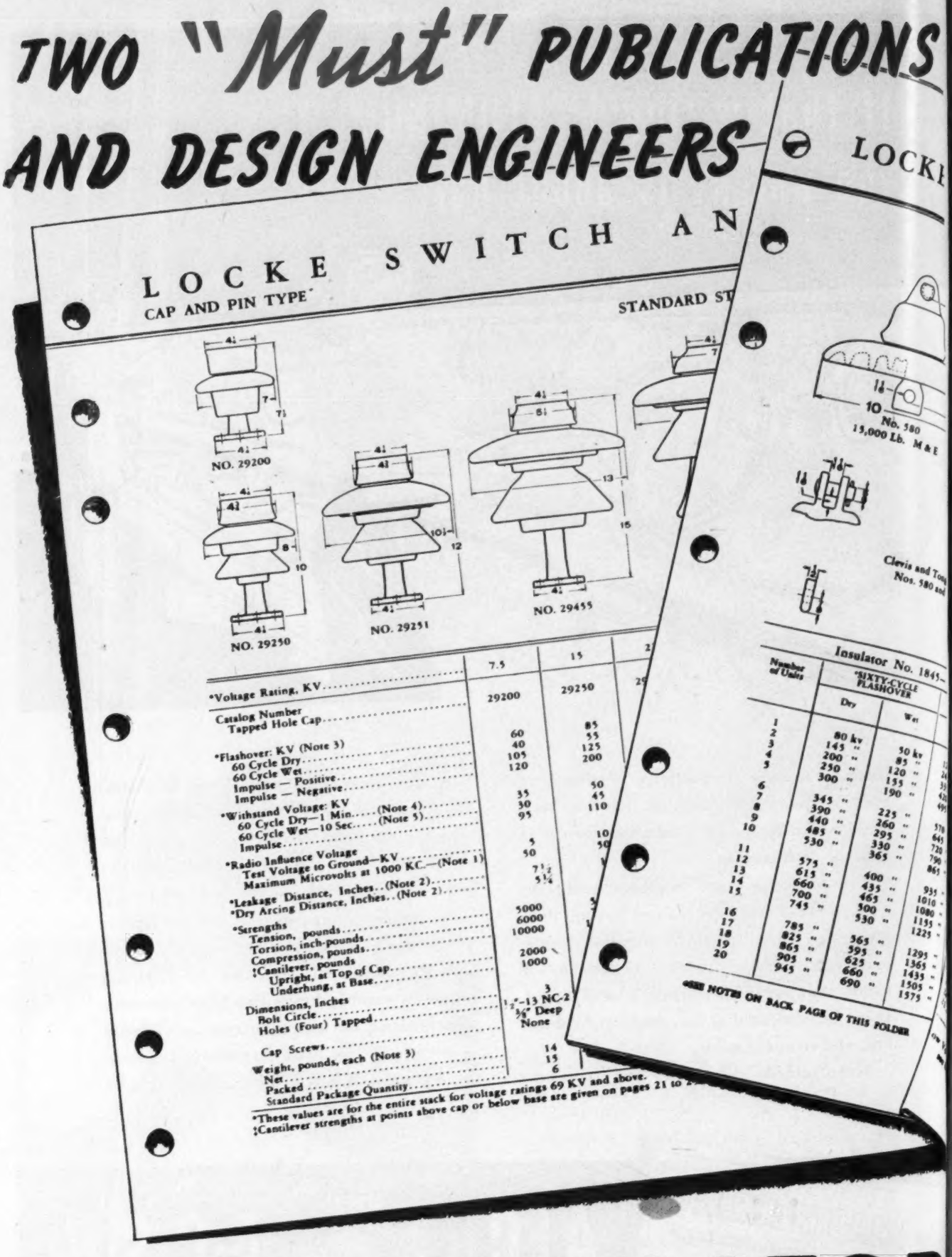
Manufacturers who wish to experiment with aluminum conductors should be certain that they specify *electrical conductor metal*, which gives them maximum electrical conductivity. Alcoa engineers can supply you with any technical data you may need.

Aluminum is not now available for civilian power line and bus construction. It is reasonable to assume, however, that for vital war purposes manufacturers can have aluminum allocated for use as conductors in airplanes, if they prove the need. ALUMINUM COMPANY OF AMERICA, 2138 Gulf Bldg., Pittsburgh, Pa.

IMAGINEERING AT WORK

ALCOA A·C·S·R

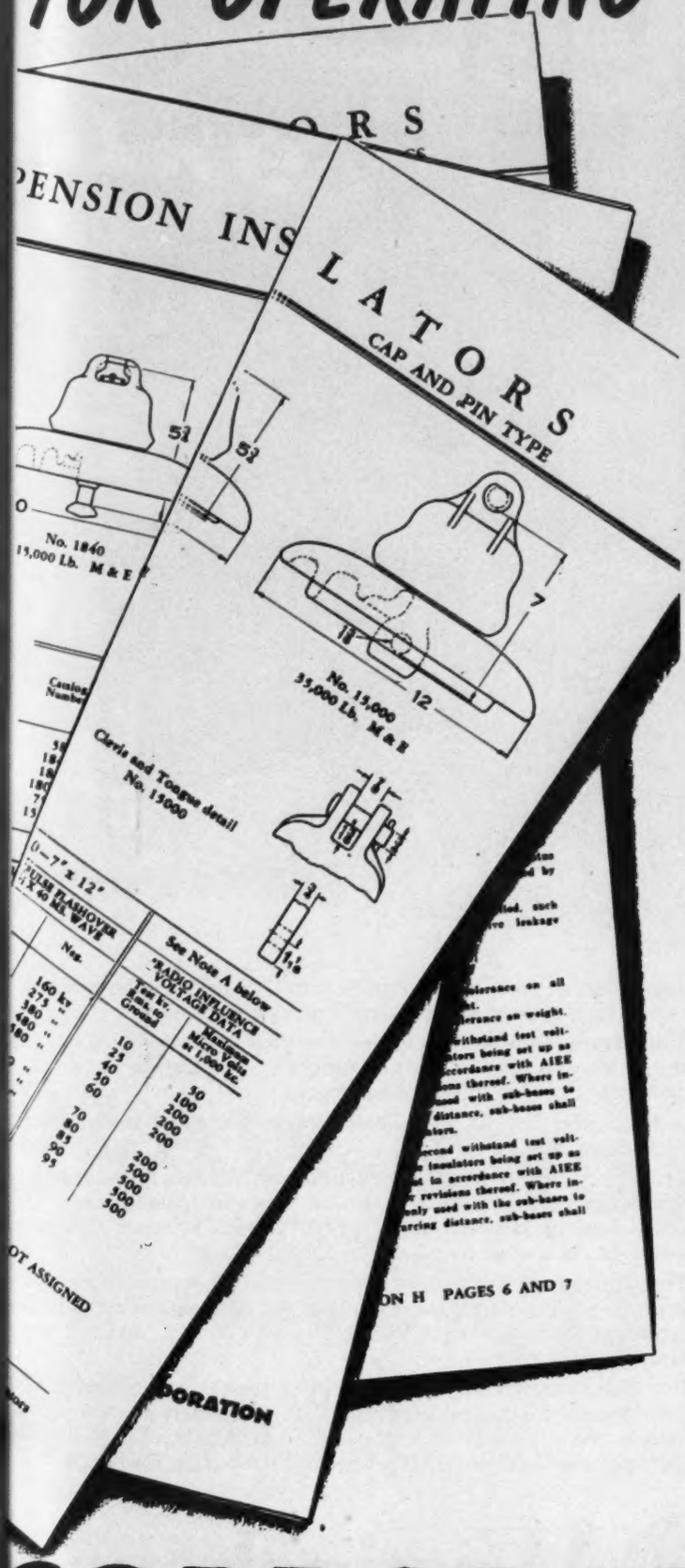
TWO "Must" PUBLICATIONS AND DESIGN ENGINEERS



LOCKE INSULATOR

FIFTY PROGRESSIVE YEARS OF SERVICE TO THE ELECTRICAL INDUSTR

FOR OPERATING



THESE TWO PUBLICATIONS list in convenient, get-at-able form full details and characteristics on all suspension and outdoor switch insulators which can be manufactured until the war has been brought to a victorious conclusion.

If you are concerned with the operation of existing lines or the design of new ones these two publications should be right at your elbow all the time. In keeping with the times they've been condensed to the barest essentials and yet the information is THE MOST COMPLETE LISTING OF PHYSICAL, MECHANICAL AND ELECTRICAL CHARACTERISTICS THAT HAS EVER BEEN COMPILED.

More than likely the insulators you are now using are included in this conservation line up. If not you will readily find in these few, easily read pages an equally satisfactory unit completely interchangeable with your present standards.

If special conditions arise, where inability to obtain insulators other than those now being manufactured would cause undue inconvenience or hardship, special approval may be granted by the War Production Board.

Of course, while the supply lasts many insulators not now manufactured are available. Any Locke district representative will be glad to tell you which these are and how many are in stock.

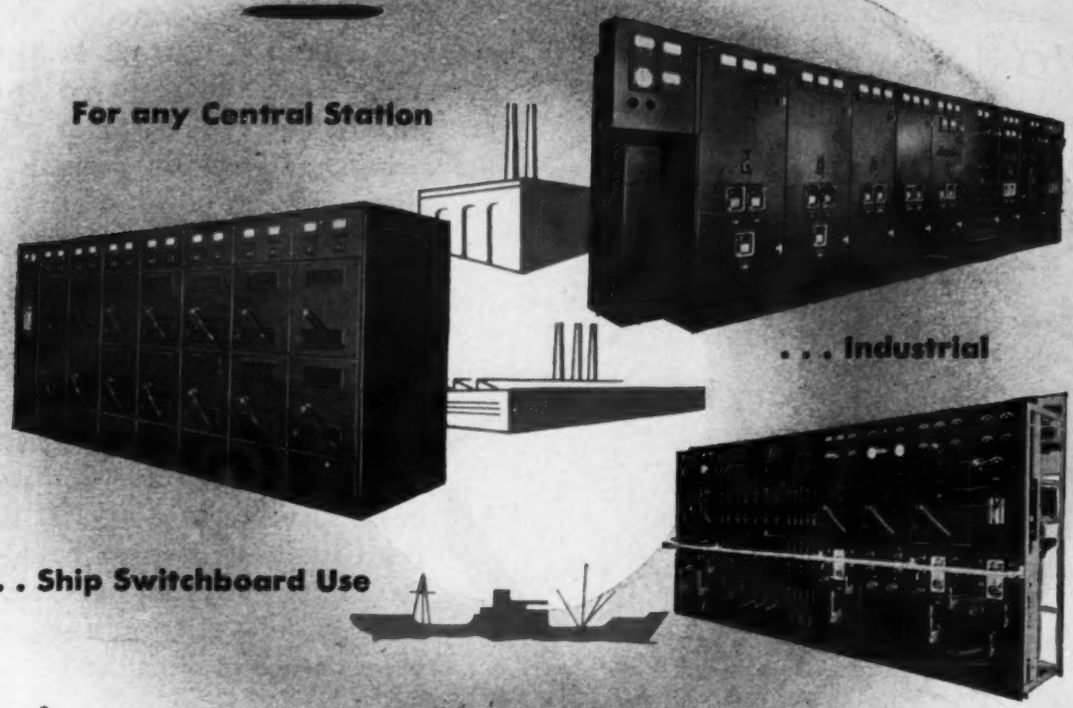
If you have not already received these data sheets write for them today. If you wish we will be glad to include a copy of Schedule 5 of Order L-154 to which this limitation conforms.

CORPORATION BALTIMORE —3— MARYLAND

FIFTY PROGRESSIVE YEARS OF SERVICE TO THE ELECTRICAL INDUSTRY

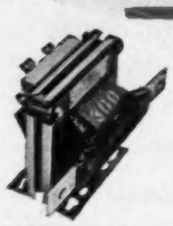
Your Best Bet—

TO GET THE RIGHT INSTRUMENT TRANSFORMER

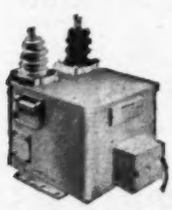


-select from the complete Westinghouse line!

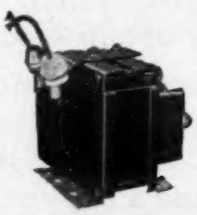
Type CT Indoor Current Transformer for 5, 8.7 and 15-kv service built to the standardized EEI-NEMA dimensions and performance.



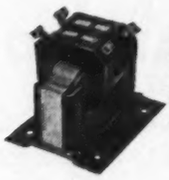
Type KO Indoor Current Transformer for 5,000-volt service. Dependable metering accuracy . . . lower burdens.



Type PT Indoor Potential Transformer. Primary rating 230 to 14,400 volts. High accuracy . . . heavy burdens . . . high impulse level.



Type VS Indoor Potential Transformer. Primary rating 230 to 2,300 volts. Metering accuracy . . . heavy burdens . . . small size and weight.



Type CV Indoor Potential Transformer. Primary rating 115 to 600 volts. New lightweight design . . . small size . . . high accuracy . . . heavy burdens.

Regardless of your requirements, you'll do better by standardizing on Westinghouse Instrument Transformers.

First, completeness of line assures your getting the *one* unit that meets your specific size . . . weight . . . mounting . . . burden limitations . . . with highest accuracy.

Second, you benefit from uniform standards of manufacture and performance.

Third, you realize tangible benefits from Westinghouse research and manufacturing experience on all types of transformers. The development of Hipersil steel, which carries ⅓ more flux with less weight, is a case in point.

Five units (as illustrated) meet 80% of all requirements, but many more types and sizes are available. See your Westinghouse Instrument Transformer Catalog No. 45-000 . . . make it your *standard* reference.

For Navy and other jobs requiring highly specialized units, Westinghouse furnishes Instrument Transformers built to specifications. Ask your Westinghouse Representative for details. Westinghouse Electric & Mfg. Co., E. Pittsburgh, Pa., Dept. 7-N.

J-70405

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Like Giants in single file
THEY look like giants, these Blaw-Knox Transmission Towers, striding single file across the landscape.
They are giants; for in their grip of steel is power for a thousand mills. Utility engineers around the world have long appreciated — in Blaw-Knox towers — the strength and durability and scientific design that make for efficient and economical operation.
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WIRES AND CABLES
Pittsburgh, Pa.

Opportunity in the Conservation Program

Success comes mostly from seeing and using opportunities.

For the second time in its history the electric utility industry embarks — rather, will embark September 15 — on a national program to curtail the use of electricity. In World War I the government ordered "lightless nights" and "workless Mondays" to save coal, which was dangerously short in many cities.

This time the government issues no orders. The program is voluntary, and in that respect the occasion is unique. Never before have the utilities undertaken nationally to employ the forces of salesmanship and advertising to effect a decrease in the use of electricity. Although it appears to be an about-face of promotional effort, the program, if wisely handled, can be a long step forward in improvement of the utilities' position in public regard and eventually in actual load building.

Definitely there is no general shortage of electricity supply capacity. So far as ability to serve is concerned, the utilities are in good shape. In the 21 months since Pearl Harbor they have never faltered in their job of serving the nation, and they will not falter.

The conservation program will accomplish some saving in fuel. The amount saved will be very small in the national total, less than one percent of the coal produced annually. But, small in proportion, the saving will be a lot of coal, four or five million tons perhaps. There will be a saving of tungsten, a critical metal, by reason of lessened use of incandescent lamps. This saving also will be very small percentage-wise, and is even less capable of definite statement than is the possible saving in coal. However, both savings are worth while in the Scotch economy of wartime.

The important thing from the utilities' standpoint, the prime consideration they must get across to their customers, to the whole public, is that, acting as good, patriotic citizens, they are joining with other industries—transportation, water, gas, coal, petroleum and communications — to save critical resources of manpower and materials in order to shorten the war. The utilities are co-operating in this conservation effort willingly and wholeheartedly. It will reduce their revenues. In many individual cases it will be extremely difficult to persuade customers to cut down use of electricity where local fuels or hydro power are available in plenty.

In the difficulties of the program lie its opportunities. If the program were an order by government the utilities could say to their customers, "Look, we like this less than you do. But we've got to do it." That would be an easy out. That, it would be hoped, would divert ill will from the utilities.

But how infinitely better to have no ill will at all! The program is voluntary; willingly the utilities promote conservation and willingly their customers respond by saving electricity; all are united in common effort and sacrifice to help win the war sooner. Here is opportunity for that kind of "togetherness" that results in friendship. And on such friendship, when the war is won, the utilities can build a market for their service such as they have never known before.

Truck Adapted to Use of Air-Operated Tools

Portable compressor powers digging and tamping operations — Chassis trade-in value preserved by crew-cab in body — Other aids to efficiency and manpower conservation

E. M. BUSH, Rockland Light & Power Company, Nyack, N. Y.

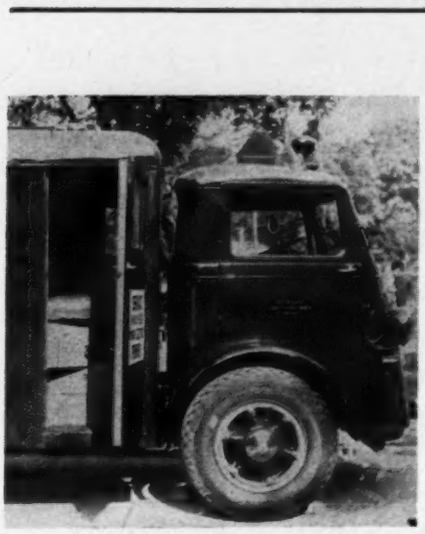


FIG. 1—Specially designed Baker-Raulang body on International truck chassis has crew compartment incorporated in it rather than standard cab modified to provide for five-man gang

UNDER present conditions every effort has to be made to conserve manpower in utility operations. Several measures have been instituted in the organization and truck equipment of the line gangs to mechanize their operations and render a five-man crew capable of completing assignments for which seven-man crews were formerly employed. Briefly the more important measures involve selection and promotion of crews, extensive use of compressed-air equipment and improved design of truck bodies more efficiently to serve the mechanization of the more compact crews.

Five-man crews are not in themselves a new departure, nor is the design of truck cabs to accommodate either the seven-man or five-man crews. However, it has been our experience that there is negligible trade-in value for cab and chassis if the standard cab has been replaced by one designed to provide space for the gang. For that reason we retain the standard cab and have the crew space built into the front part of the special body, which also incorporates the other features to be mentioned. Then when it comes time for trade-in of the truck the body is removed and retained for installation on a new chassis. The compartments for the driver and one member of the gang are thus physically separate (Fig. 1) from that for the remaining linemen. Their cab is well ventilated by windows on both sides in addition to

* Superintendent of Transportation.

FIG. 2—Three of crew ride in ventilated compartment built into special body on Autocar chassis; windows on front, sides and rear afford ample vision and ventilation

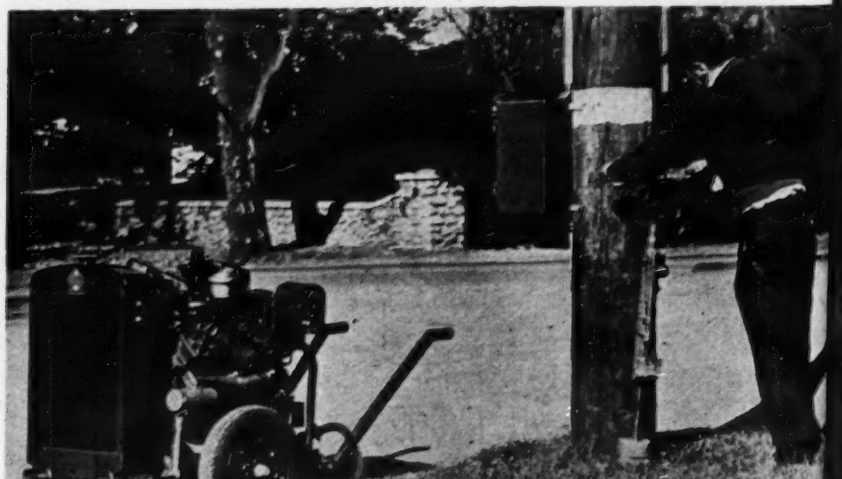


FIG. 3—Portable compressor left by truck provides air for operating tamping tools; chassis has side rails of 4-in. diameter tubing to act as air reservoirs; gasoline tank slung between them

lower ventilator (Fig. 2) at the front corner; the second cab is also open into the truck compartment. There is a Caboscope in the driver's cab roof so that he can observe operations and obstacles behind the truck without craning his neck out of the window.

Portable Air-Compressors

Much of the territory covered by the company is rocky and is not conducive to the use of augers in making pole holes. In an alternative approach to the use of mechanical aids to ease the task of hole digging by the line crews, air-driven tools have been devised for use in conjunction with a portable air compressor that is carried on the truck. These equipments loosen the dirt for easy removal by hand and subsequently tamp it down to give a much firmer support for the pole than could ever be done by hand.

The air compressor is a Schramm Fordair 55 unit (Fig. 3), which is a V-8 engine modified to use four cylinders for powering the other four cylinders as air-compression chambers. It has a battery for electric cranking and a panel which embraces a key ignition switch, choke, starter button, air-pressure gauge, oil pressure gauge and battery-charge ammeter. The air cylinders are provided with intake valve unloaders to regulate the duty on the cylinders and limit the pressure to 100 lb. per square inch when delivering 55 cubic feet of air per minute.

Portability of Compressor

The compressor is not designed for towing, but is carried inside the truck, where space is provided for it directly behind the crew cab. It is placed crosswise (Fig. 4) and after being skidded out to the edge of the door opening it is lowered by means of the power winch onto a two-wheel dressed-axle rubber-tired dolly which is hung just inside the door of the compressor compartment and is removed before taking the compressor from the truck. The load is balanced so as to handle easily, but with slight excess of weight on the handle side. Latches are provided to lock the chassis to the axle. As shown in Fig. 1, the lineman is using the compressor to tamp the earth about a pole; the line truck and the rest of the gang were 8 miles away doing another pole job when this picture was taken.

Air hose is carried in a compartment under the crew seat and there are companion compartments for the rubber pigs and blankets used by the gang. On the back of the crew seat are two insulated compartments, each large enough to hold three lunch kits and keep their contents at desired temperatures. Water for drinking can be drawn from another insulated compartment without having to open a door for the purpose.

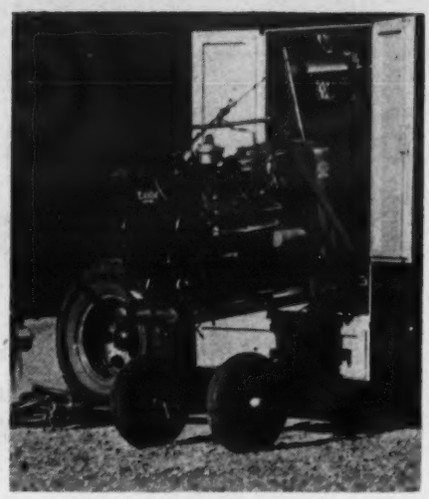


FIG. 4—Compressor slung out by winch for mounting on wheels carried in slot showing in shelf just below sheave

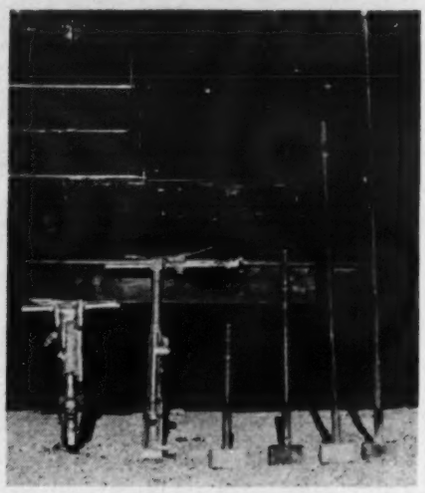


FIG. 5—Power heads for digging chisel (not shown) and set of air-operated Schramm tamping tools

FIG. 6—Truck body has hinged compartment for extension ladder and numerous bins for small tools

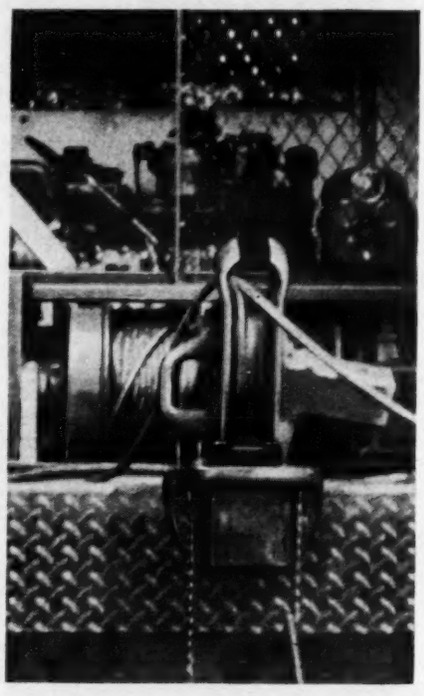


FIG. 7—Separate screened compartment up forward for portable air compressor; Universal sheave block in place on tail-edge of truck floor

Air-operated Tools

No attempt is made to excavate the earth from a pole hole by means of the air-operated tools. The tools (Fig. 5) merely chisel the earth loose and free the rocks so that the material can be removed easily by hand scoops. Tools are provided for breaking pavement and for drilling rock when blasting is necessary.

The tamping tools are an especially important part of the equipment because they do a far better job than can possibly be done by hand. In fact, it is often the case that the lineman will have to get some extra earth to finish filling a tamped hole, so well has the replaced earth and that for some distance out from the pole been compacted—when tamped by hand there is usually a surplus that approximates the volume of the pole butt. The result is that leaning poles are practically ruled out, even in spongy ground, so greatly is the diameter of the compacted earth mass increased and the effective foundation of the pole enlarged. The problem of guying and anchors is reduced accordingly. It is believed, too, that decay of the butt is effectively re-

tarded because the compacted earth tends to keep moisture away from the buried wood.

The digging and tamping tools are carried in boxes that extend across the body, thus making them accessible from either side of the truck.

Other Features

Earlier truck bodies were designed to carry the extension ladder on hooks on the outside of the body. The latest designs, built to our specifications by Baker-Raulang, have a special compartment (Fig. 6) on the upper left side with a hinged door in which the ladder is placed by one man with easy reach from the ground. The door is then swung shut, inclosing all but the slightly projecting end at the rear; the front end of the ladder butts against the rear of the crew seat without obscuring the view or the ventilation through left window.

Tool compartments on both sides are painted white to encourage neatness and good housekeeping on the part of the crews.

On the tail-edge of the truck floor in Fig. 7 is the universal sheave-block built by the Mead-Morrison division of Gar Wood Industries, Inc. It has proved a great conserver of winch lines that formerly wore out unduly fast when they were chafed by the edge or side of the truck body. The two stems permit its use for pulls upward, downward or to either side when the winch is used to lift poles, pull stumps, etc.

Crew Qualifications

Recruits for line gangs are required to be high school graduates because it is found that men with that background of education are more appreciative of and responsive to measures devised to promote safety and efficiency.

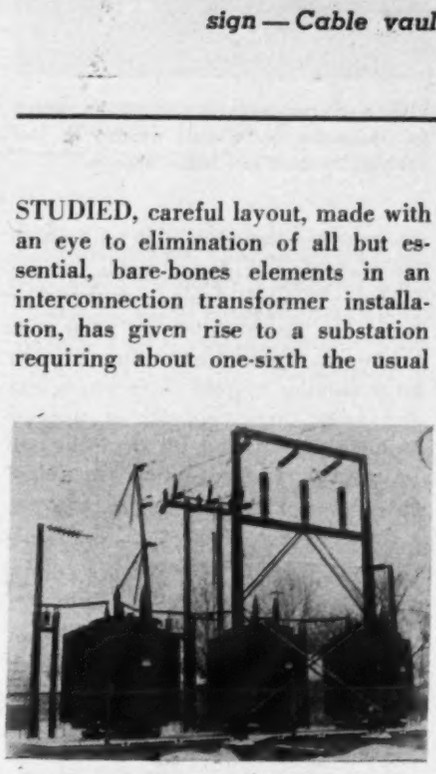
Frequent examinations are offered to test the men for gain in grasp and proficiency; the high-stand man is the one who gets the job at first and the preferred advancements subsequently.

This combination of carefully selected men and carefully evolved motive equipment with mechanical aids is not only a contribution to the solution of the manpower shortage but also a factor in cutting the expense of providing and maintaining a distribution system.

Bare-Bones Design for Transformer Station

Innovations in layout of 30,000-kva. interconnecting transformer station yield compact, minimum-steel design — Cable vault under transformer pad a feature

STUDIED, careful layout, made with an eye to elimination of all but essential, bare-bones elements in an interconnection transformer installation, has given rise to a substation requiring about one-sixth the usual amount of steel. The 30,000-kva. transformer station connects the 44-kv. transmission system of the Consumers Power Company with the 13.8-kv. system of the Lansing Water and Electric Light Commission.



BRADLEY AVENUE substation looking northwest

All steel except eight 13-ft. 6x6-in., 20-lb. H-sections was obtained from a salvaged Bates transmission tower which was cut down and used as combination take-off tower and high-tension arrester mount. Portions cut from the tower top were mounted as masts at either end of the substation to support the conductor that closed the delta connection on the high side of delta-delta transformer bank.

There is no conventional 44-kv. high-tension bus, as such, in the station. The 44-kv. steel-tower transmission line passes 78 ft. north of the station. Taps are brought in to a single wood-pole angle structure and dead-end on a two-pole wood H-structure, atop which are mounted the necessary air-break disconnect switches.

The three high-tension phase conductors pass from the air-break switches 33 ft. 9 in. above grade and over the transformers to dead-end on the cut-down Bates tower. From this short span taps are brought down from the outside phases to the high-tension transformer bushings. The middle phase is connected to a single conductor strung between masts (previously referred to). From it taps are led to outside transformer high-tension bushings, completing the delta.

From the 13.8-kv. secondary transformer bushings ¼x4-in. copper busbars pass directly to outgoing cable potheads on cable risers supported by short steel H-section columns set in the concrete of the transformer pad. No additional insulator supports were used.

Continuous Busbars

The ¼x4-in. copper busbars that connect like transformer phase terminals to the cable riser potheads are continuous from one transformer bushing to the next, a feature that should facilitate future salvage.

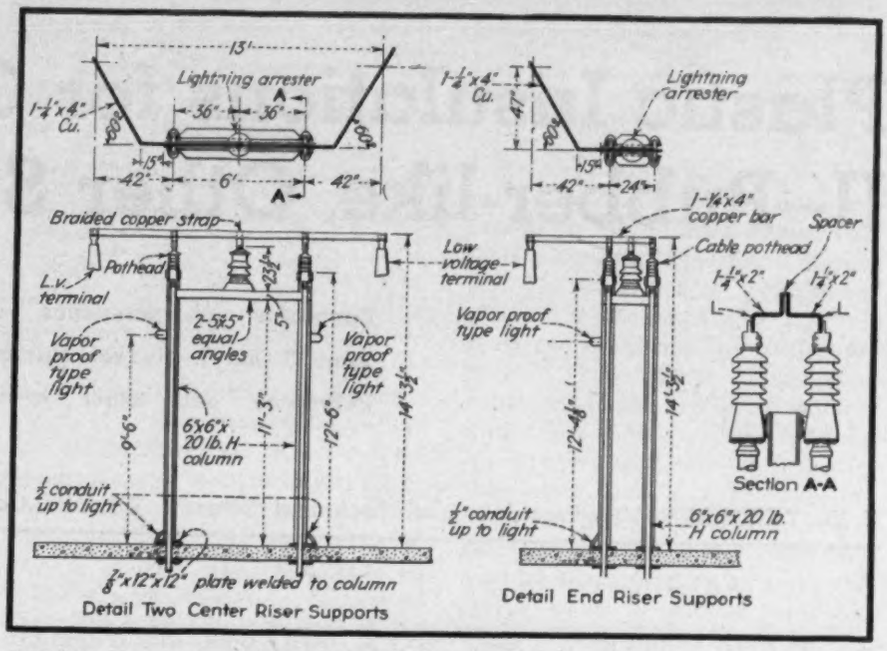
There are four parallel 13.8-kv. cables per phase on the secondary side. Two additional short cables pass down and under the transformer pad and up on the other side to close the ends of the secondary delta. These cables are arranged in groups of four risers across the west side of the

transformer pad. Two risers in each group of four are supported on a separate 6x6-in., 20-lb. H-column. The two columns are joined at the top by two 5x5-in. equal angles on which is mounted the low-voltage lightning arrester.

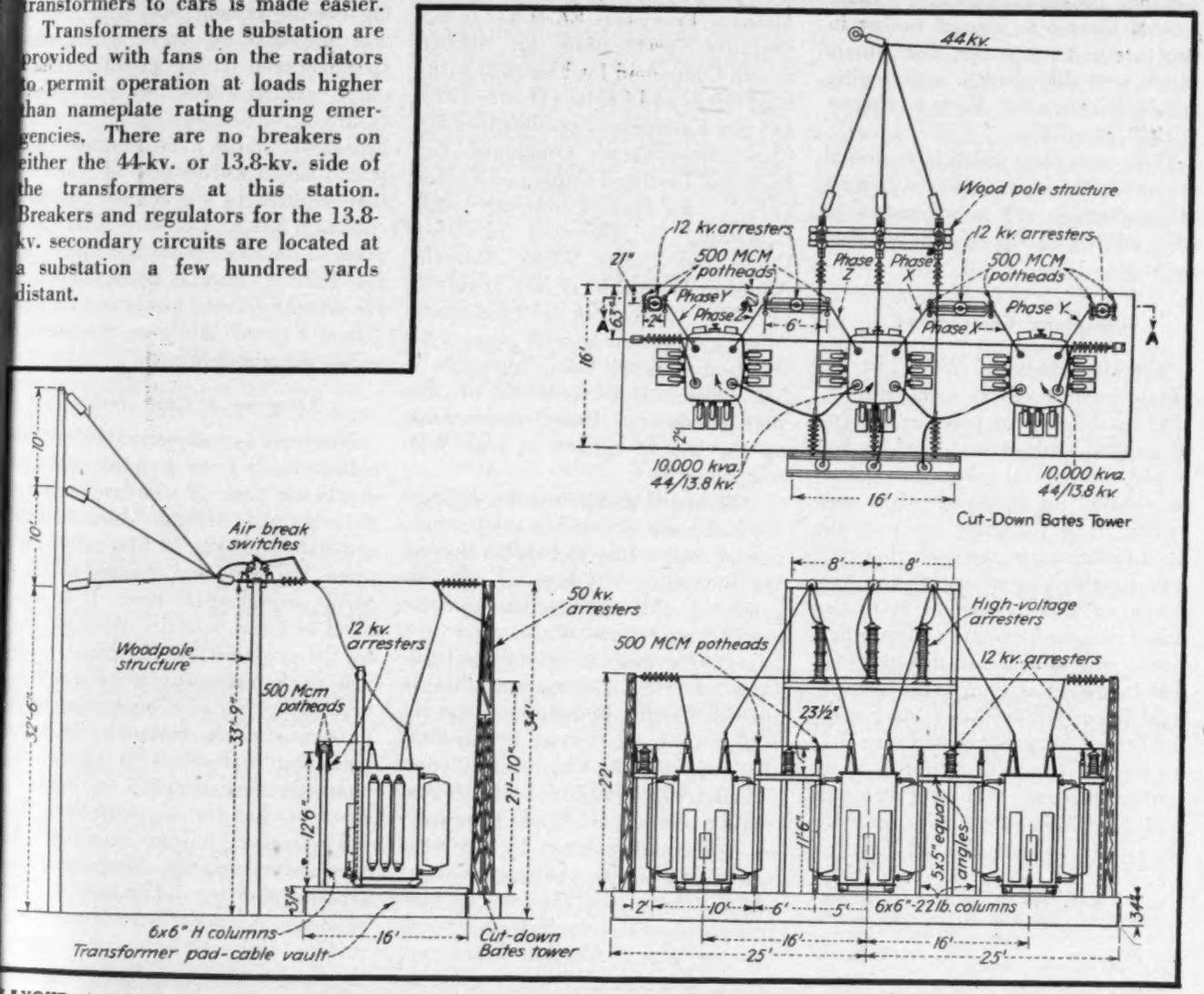
Transformer Pad

The outgoing secondary cable risers pass down through the reinforced concrete pad on which the transformers are mounted into a cable vault below. The three 10,000-kva., 44/13.8-kv. transformers at this station are mounted on a 50x16-ft. hollow "pad" extending 34 in. above grade. This pad, in addition to supporting the transformers, also comprises the vault from which the cable runs to the nearby Moores Park station. By allowing the vault to project above grade excavation for the vault was reduced and removal of the transformers to cars is made easier.

Transformers at the substation are provided with fans on the radiators to permit operation at loads higher than nameplate rating during emergencies. There are no breakers on either the 44-kv. or 13.8-kv. side of the transformers at this station. Breakers and regulators for the 13.8-kv. secondary circuits are located at a substation a few hundred yards distant.



DETAILS of secondary 13.8-kv. pothead and arrester mounting



LAYOUT of 30,000-kva., 44/13.8-kv. substation connecting Lansing municipal with neighboring utility system

Plastic Insulations for Conductors II—Rubber-like, Other Synthetics*

Favorable characteristics and limitations of Neoprene, Buna S. Butyl, Thiokol, Hycar, Perbunan, Chemigum, Vistanex, Polythene and other synthetics for wires and cables

E. D. YOUMANS, Vice-President and Technical Director, Okonite Company, Passaic, N. J.

"SYNTHETIC RUBBER" is a term which embraces Neoprene, Buna S and Butyl (and a few other less important) because they exhibit more general kinship to natural rubber in structure and properties than others which were discussed in a preceding article (ELECTRICAL WORLD, August 7, 1943, page 53).

These and others which have special properties for insulation or sheathing of conductors will be discussed in what follows. Neoprene will be taken up first.

Neoprene, Chloroprene

The latest issue of WPB List 27, which became effective on July 1, 1943, established Neoprene as the type of synthetic rubber preferred for use in place of natural rubber for jackets or sheaths on insulated wires and cables. It is fortunate for both the manufacturers and the users that such a thoroughly proved material as Neoprene, or Chloroprene as it is also called in some literature and specifications, is available for this purpose. The following as quoted from the Annual Report of the American Society for Testing Materials, Committee D-11 on Rubber Products submitted at the annual meeting held at Pittsburgh, Pa., June 28 to July 2, 1943, provides an excellent description of the situation in recent months with respect to jackets for wires and cables:

"On April 15, 1943, Committee E-10 accepted revisions in Emergency Alternate Provisions EA-D 532 in the Tentative Specifications for Rubber Sheath Compound for Electrical Insulated Cords and Cables (D 532–39T) and new Emergency Specifications for Chloroprene Sheath Compound for Electrical Insulated Cords and Cables (ES-28), and for Chloroprene Sheath Compound for Electrical Insulated Cords and Cables Where Extreme Abrasion Resistance is Not Required (ES-30). Changes in the Emergency Alternate Provisions with respect to the Rubber Sheath Compound (EA-D 532) were made necessary by the War Production Board restrictions on the use of rubber in type WD compound.

"Continued and increasing difficulties had been reported in the production of satisfactory jackets because of the increasing shortage of suitable grades of rubber and reclaim until the need for immediate relief became very urgent. The new emergency specifications covering Chloroprene sheaths provide for the elimination of natural rubber from this service by substitution of suitable Chloroprene compounds. The substitution of this synthetic material had already been made to an increasing extent by the Navy and Signal Corps. As more Chloroprene became available due to completion of new manufacturing facilities, the War Production Board gave notice that natural rubber must be eliminated from this use and that Chloroprene would be allocated as a substitute.

"With this change imminent, the need for an industry standard covering the use became very urgent and was provided by these emergency specifications. It is probable that other synthetics will also be applied to this service in the future as they become available. The Sheath Compound ES-28 will be used in place of that required by the Rubber Specifications D 532, and ES-30 will take the place of the Emergency Specifications for Rubber Sheath Compound for Electrical Insulated Cords and Cables Where Extreme Abrasion Resistance is Not Required (ES-6)."

Neoprene a Good Jacket

Neoprene is polymerized chlorobutadiene made from acetylene and hydrochloric acid. It was developed by duPont and became commercially available in 1932. At first called Duprene, the name was changed to Neoprene several years later. It is supplied as a raw material which is used by the producers of Neoprene products in the same way as natural rubber. Neoprene is compounded with numerous other materials or compounding ingredients to obtain the characteristics required in the finished product for the particular service intended. Rubber machinery is used for mixing the Neoprene compounds and for fabrication of the products. Neoprene is a thermosetting material and must be heated to cure it the same way as rubber is vulcanized by heating.

*This is the fourth in a series of articles treating plastics appropriate for electrical applications. Preceding articles appeared in the April 17, 1943, June 12, 1943, and August 7, 1943, issues of Electrical World.

†Effective September 1, 1943, rubber will be restricted to use on conductors solely for military purposes.

The dielectric characteristics of Neoprene are so poor that it is unlikely that it will be used to any extent for insulation. This is an inherent property of the material which apparently cannot be greatly improved without a substantial change in its composition and a sacrifice of other valuable characteristics. The use of Neoprene compounds for wires and cables is, therefore, almost completely confined to jackets or sheaths.

Neoprene being a thermosetting material, its compounds behave more like rubber compounds over a broad temperature range than do the thermoplastic synthetic compounds. Neoprene compounds, like rubber compounds, after curing do not soften excessively at elevated temperatures until the decomposition point is reached, approximately 175 to 200 deg. C., depending upon the composition of the compound. Neoprene compounds have excellent stability at elevated temperatures as compared with rubber compounds and on extended exposure retain their properties better than the best rubber compounds. Neoprene compounds are generally better than the thermoplastic synthetic compounds and more like rubber compounds at lower temperatures. They are not equal to good rubber compounds, however, at extremely low temperatures, becoming stiff and breaking when bent at temperatures of —40 deg. C. and lower. Recently a type of Neoprene has been made available which is definitely better in flexibility at extremely low temperatures than the Neoprene which is in general use.

Other Neoprene Characteristics

Other important characteristics of Neoprene compounds of the type used for high-grade wire and cable jackets or sheaths are as follows:

1. Not affected by long exposure to the most severe wet conditions, but not equal to the best rubber sheaths as a moisture seal when used as a sheath or jacket.
2. Excellent aging and stability at both room temperature and at the maximum operating temperatures recommended for rubber compounds.
3. Much superior to rubber in oil and solvent resistance with some exceptions such as the unsaturated or aromatic hydrocarbons of coal tar origin. At least equal to the best rubber compounds in resistance to attack by acids, alkalies and many chemicals.
4. Do not deteriorate in the way rubber compounds do when exposed to sunlight and the weather. Good ozone resistance.
5. Relatively non-flammable and far better than rubber compounds in this respect.
6. Neoprene will not support the growth of fungus spores even under the most favorable conditions and is extremely mildew and fungus resistant.
7. Extensive experience shows Neoprene jacket compounds to be satisfactory for the most severe portable cable service. They have proved superior to the best rubber compounds for such use.

Splices and repairs in Neoprene-jacketed cords and cables should be cured in order to obtain proper mechanical characteristics. This must be done by heating, preferably in a metal mold. If a mold is not available it can be accomplished by wrapping the splice or repair in tight wound fabric tapes and heating. The temperature used should be approximately 140 deg. C. and the time from 30 to 60 minutes, depending upon the size of the cable. Neoprene tape used for splicing and repairs must be used as fresh as possible and within three or four months at the longest as it is characteristic of uncured Neoprene compounds to setup on aging and lose their fusing and other properties required in a satisfactory splicing tape. For some conditions and under some circumstances, such as where a Neoprene tape or curing facilities might not be available, fairly satisfactory results can be obtained by making splices and repairs with rubber splicing tape and friction tape or even friction tape alone.

Experience and Specifications

Actual service experience with Neoprene compounds for jackets and sheaths started back in 1933 on portable cords and cables. The oil resistance and superior aging of Neoprene compounds when exposed to heat, sunlight and the weather were responsible for their use at that time rather than the need for substitute materials, as there was then no scarcity of rubber. The wire and cable industry soon became the largest user of Neoprene and has continued to be ever since. Neoprene compounds are now so well established for use as jackets and sheaths that several accepted specifications are available, including the following:

American Society for Testing Materials, Emergency Specifications for Chloroprene Sheath Compound for Electrical Insulated Cords and Cables, Serial Designation ES-28.

American Society for Testing Materials, Emergency Specifications for Chloroprene Sheath Compound for Electrical Insulated Cords and Cables Where Extreme Abrasion Resistance Is Not Required, Serial Designation ES-30.

National Electrical Manufacturers Association, Standards for Thermosetting Synthetic Jacket Compound for Wire and Cable.

Neoprene compounds are working so satisfactorily for jackets and sheaths on wires and cables that they make possible a large saving of rubber. The production of Neoprene has been greatly increased in the past two years and it is being still further extended. There have been numerous reductions in the price of Neoprene, with a corresponding decrease in the cost of wires and cables on which its compounds are used. The superior characteristics of Neoprene compound as against rubber compounds for jackets and sheaths on wires and cables make it another synthetic which will have a permanent place in the industry.

Buna S

Buna S or GRS, as it is officially designated by the War Production Board, is the type of synthetic rubber which will be produced in by far the largest quantity under the government synthetic rubber program. Buna S is also the type of synthetic rubber which the Rubber Director's Office of the WPB wants used in wire and cable insulations in place of natural rubber. The wire and cable manufacturers are making every effort to accomplish this and good progress is being made.

Buna S is a copolymer of butadiene and styrene. Part of the government synthetic rubber production uses butadiene of petroleum origin and the rest is derived from grain alcohol. Styrene is made from benzol and ethylene. Three parts of Butadiene are copolymerized with one part of styrene to form Buna S or GRS synthetic rubber. The ratio of butadiene to styrene in the copolymer may be varied over a considerable range and there is some experience which indicates that a higher styrene content would yield a preferable type of synthetic rubber for use in insulation. The government authorities have decided, however, to standarize at least for the present on the 3:1 butadiene-styrene ratio in order to provide the maximum quantity of all-purpose synthetic rubber.

Can Replace Rubber

Buna S is supplied as a raw material and is used by the manufacturers of rubber products in the same way as

Synthetic Materials With Promising Characteristics as Alternatives to Rubber for Wires and Cables

Name	Chemical Type	Remarks	Type of Use	Dielectric Prop.	Chem. Prop.	Resis. to Ozone & Sunlight	Physical Prop.	Nonflammability	Oil Resis
Koroseal	Plasticized Vinyl chloride Polymer	Thermoplastic. Extrudable. Several types.	Insulation or Jacket	F	E	E	G	E	E
Vinylite	Plasticized Vinyl chloride-Vinyl acetate Copolymer	Ditto.	Insulation or Jacket	F	E	E	G	E	E
Neoprene	Chloroprene Polymer	Vulcanizable. Rubber-like. Extrudable or calendered strips. Several types.	Jacket	P	E	E	G	E	G
Buna S	Butadiene-Styrene Copolymer	Vulcanizable. Rubber-like. Extrudable.	Insulation or Jacket	G	G	F	G	P	F
Butyl Rubber	Isobutylene-Diolefin Copolymer	Ditto.	Insulation	G	E	G	G	P	P
Hycar OS-10	Butadiene-Styrene Copolymer	Vulcanizable. Rubber-like. Extrudable. Higher styrene content than Buna S.	Insulation or Jacket	G	G	F	G	P	F
Hycar OR-15 and OR-25	Butadiene-Acrylonitrile Copolymer	Vulcanizable. Rubber-like. Extrudable or calendered strips.	Jacket	P	G	P	G	P	G
Perbunan	Ditto	Ditto	Jacket	P	G	P	G	P	G
Chemigum III	Ditto	Ditto	Jacket	P	G	P	G	P	G
Thiokol	Organic Polysulfides	Both thermoplastic and vulcanizable types. Extrudable.	Jacket	P	G	E	F	P	E
Polybutene	Isobutylene Polymer	Not vulcanizable. Rubber-like. Mixed with resins or rubber. Extrudable.	Insulation	E	E	E	F	P	P
Polythene	Ethylene Polymer	Thermoplastic. Extrudable.	Insulation	E	E	E	E	P	F
Saran	Vinylidene chloride-Vinyl chloride Copolymer	Thermoplastic. Applicable as threads or tapes.	Insulation	F	E	E	G	E	E
Tenite II or Kodapak	Cellulose Derivative	Thermoplastic. Extrudable or applicable as tapes. Cellulose-acetate-butyrate.	Insulation	F	G	G	G	F	G
Ethyl Cellulose	Cellulose Derivative	Thermoplastic. Extrudable. Cellulose ethyl ether.	Insulation	F	G	G	G	F	G

E—Excellent, F—Fair, G—Good, P—Poor. Dielectric properties include dielectric strength, capacity, power factor, insulation resistance, etc. Chemical properties include resistance to oxidation, acids, alkali and moisture. Physical properties include tensile strength, elongation, modulus, toughness and abrasion resistance.

natural rubber. It is compounded with other materials and these compounds are processed and vulcanized with standard rubber manufacturing equipment. Proper Buna S compounds are in general quite similar to the corresponding compounds made from natural rubber. This is particularly true in the case of compounds made with a relatively small content of natural rubber or Buna S. For example, code grade rubber insulation as ordinarily made contained from 5 to 10 percent of new rubber plus a considerable amount of reclaimed rubber. Buna S can be substituted for all of the new rubber in this compound without any apparent change in the properties or appearance of the insulation. Oil base or ozone resistant compounds, while containing substantially more new rubber than code grade, can also be made with Buna S without sacrifice of their excellent quality or suitability for the most severe service conditions. In the case of insulations made with a relatively high rubber content, it is more difficult to substitute Buna S for all of the natural rubber and maintain all of the desired characteristics to an equal degree. However, it is anticipated that this will be accomplished. Buna S will also be used for jacket and sheath compounds.

Specifications in Process

Preparation of specifications for Buna S insulation and jacket compound is under way. The test requirements will at first necessarily be somewhat less rigid than those in the specifications for the corresponding grades of rubber insulation. This is because of the extremely limited manufacturing experience and almost total lack of actual service experience with Buna S compounds for wires and cables. This situation results from the fact that Buna S up until now has been available only in experimental quantities. On the other hand, the manufacturers must start to use it immediately in place of natural rubber as the only obtainable material that will provide the necessary properties. The present high degree of development of rubber insulation was achieved through many years of effort and experience. It is a radical move to have to change almost overnight from natural rubber to Buna S. However, it is expected that it will be possible to make the test requirements of the specifications for Buna S compounds more rigid as knowledge of how to handle and compound the material increases.

The price of Buna S as established by the government authorities is about the same as that for which natural rubber has been purchased in the past year or two. There will be extremely large quantities of Buna S produced when the government plants all come into production, which it is now expected will be by the end of 1943. Its relatively low cost as against Koroseal, Vinylite and Neoprene and the fact that it will be plentiful make it likely that Buna S will be used on a large scale for both insulation and jackets on wires and cables.

Butyl Rubber

Butyl rubber is the third type of synthetic rubber contemplated under the June 18, 1943, issue of List 27 for use on wires and cables along with Neoprene and Buna S. Butyl rubber is a copolymer of isobutylene, a petroleum derivative, and a small amount of butadiene or isoprene. A

substantial tonnage of butyl rubber will be produced under the government synthetic rubber program. The butyl rubber available to the wire and cable industry is at present limited to experimental quantities and it now appears as if this condition may continue until the early part of 1944.

Butyl rubber is a thermosetting material. It is compounded and processed on rubber machinery and its compounds must be cured by heat in the same way as rubber is vulcanized. The limited amount of work that it has been possible to do with the small quantities of butyl rubber received by the wire and cable manufacturers indicates that it should become a highly valuable material for use in insulation in place of natural rubber. Compounds can be made with butyl rubber which possess an excellent combination of dielectric and mechanical characteristics along with good ozone resistance. It is expected that butyl rubber will find a permanent place in the insulated wire and cable field.

Thiokol and Other Synthetics

The foregoing (including the preceding article) covers the five synthetic rubber-like materials which at present, under rapidly changing conditions, are being used or are likely to be used in largest quantities for insulated wires and cables. A number of other synthetics, some of which are now being used on wires and cables for special purposes and others of which have properties of interest in connection with wires and cables, are given in the accompanying table. A brief discussion of the more important of these materials follows:

Hycar OS is a thermosetting copolymer of butadiene and styrene similar to Buna S. It has been supplied with a higher styrene content than that of standard Buna S or GRS which has been found to have some advantages for wire and cable insulation use. However, it is now doubtful whether any of these special Buna S types will be available in the near future in that the government desires to standardize on one material in order to provide the greatest amount of production.

Hycar OR, Perbunan, and Chemigum III are thermosetting copolymers of butadiene and acrylonitrile. They have poor dielectric properties, but their good oil resistance as compared with natural rubber, plus the excellent wear-resistant qualities of their compounds, makes them useful for jackets on portable cords and cables. Their use for this purpose is not provided for, however, under List 27 and it is unlikely that they will be available for the present.

Thiokol is the oldest of the synthetic rubber-like materials from the standpoint of being commercially available in this country. Thiokol is now furnished in several different types, but the original and best known is a thermosetting reaction product of an alkaline polysulfide and ethylene dichloride. This material is characterized by a disagreeable odor which has handicapped its use on wires and cables. Its excellent resistance to attack by oils, solvents and most other agents which readily injure rubber compounds resulted in its being used to a limited extent as a jacket or sheath. This type of Thiokol when used as a sheath also provides the best moisture-proof seal of any of the other rubber-like organic materials suitable for application to wires and cables. The mechanical properties of the Thiokol sheath are such that protection in the form of a fibrous braid or tape covering is necessary. Thiokol has poor dielectric properties which prevent its use for insulation.

Various Other Elastomers

Polybutene or Vistanex is closely related to butyl rubber. It is a thermoplastic isobutylene polymer whose molecules are saturated, whereas butyl rubber is isobutylene copolymerized with a small amount of a diolefin such as butadiene or isoprene. The chemically saturated nature of Vistanex makes it a thermoplastic material, while the unsaturated hydrocarbon content of the butyl rubber molecule enables it to be set or vulcanized after application to a conductor. Vistanex is a rubber-like material whose softness or firmness varies with the degree of polymerization. It is a highly stable material possessing excellent dielectric properties, particularly low dielectric constant and low power factor. Its use is completely restricted to high frequency cables at present where it is compounded with polystyrene or other materials and yields an insulation with the necessary low loss characteristics.

Polythene is an extremely interesting thermoplastic polymer of ethylene gas derived from petroleum. Its production in this country is just approaching commercial quantities and its use will be highly restricted. The exceptionally good dielectric characteristics of polythene make it very likely that this material will find a substantial place in the insulated wire and cable field in the future.

Tenite II and Kodapak which are cellulose acetate-butyrate compounds and ethyl cellulose are thermoplastic synthetic materials which are being used to a limited extent as conductor insulations. The first named is being used as an insulation layer applied in the form of tapes over the conductor in a type of building wire offered to conserve rubber. It is also being used for the insulation on low tension aircraft wires. Ethyl cellulose is being used to some extent for insulating conductors for telephone apparatus.

Summary

The foregoing provides information on the current status and conditions surrounding the use of synthetic rubber and rubber-like materials now, of necessity, replacing scarce natural rubber for insulated electrical wires and cables. It is evident that while a radical and drastic change is taking place in the industry, there is good reason to believe that this will be accomplished with a minimum of disturbance and that there will be provided insulated wires and cables of satisfactory quality and in suitable quantities to take care of our needs, both military and civilian. This is due to the good judgment and foresight used in planning and carrying out the government synthetic rubber program, which is rapidly nearing completion. It is now quite certain that the synthetic rubber program will be one of the outstanding achievements of the nation in the war.

A major factor which aided in the transition from natural rubber to the synthetics is the experience obtained by wire and cable manufacturers in using the synthetics in the past. Such use was because of their definite advantages for many purposes rather than as substitutes as there was then no rubber shortage.

Higher Lighting Voltages Save Copper*

A study of ten ways of making power available to light a typical industrial plant with fluorescent lamps using voltages up to 460 — One incandescent system used for comparison

F. C. WINKLER and H. G. BARNETT†

WHAT EFFECT has the voltage of lighting circuits upon the amount of copper used? Are the savings at higher voltages sufficient to warrant a change in interior distribution practice?

Answers to these questions will be found in the results of a study of various ways of making power available to provide 50 foot-candles of general lighting for a typical industrial plant 180 ft. wide by 390 ft. long and using 100-watt fluorescent lamps. The building is divided into 27 rows lengthwise with 33 luminaires in each row, making a total of 891 units. The various combinations of distribution voltages and luminaire voltages that can be used in the typical plant are listed in Table I.

The two basic plans of the distribution system are shown in Figs. 1 and 2. In the first plan (Fig. 1), where feeder and panelboard voltages are the same, an individual feeder is carried out to each panelboard. In the second plan (Fig. 2), where feeder voltage is higher than that of the panelboard, a feeder is carried out to a small step-down transformer located near one of the panelboards. In this arrangement two panelboards are supplied by each feeder.

The schematic arrangement of the distribution circuits in the typical plant is shown in Fig. 3 for each of the eleven different methods of supplying the lighting load. The diagrams show transformer connections, one breaker position in the switchboard, all the conductors in one feeder, the small step-down transformer if one is used, the bus and breaker arrangement in the panelboard, and one branch circuit.

Each of the methods was analyzed from the standpoint of the copper required in the circuits and the luminaires beyond the switchboard with the results as shown in Table II.

Method 1 uses 118-volt, two-lamp fluorescent units, each of which represents a load of 247 volt-amperes. A 25-amp. branch circuit which will handle eleven of these units was selected to provide reasonable switching flexibility. This arrangement requires three 18-circuit panelboards and three nine-circuit panelboards. Branch circuit current is 22.6 amp., requiring a No. 10 conductor. Load on each 18-circuit panelboard is 49 kva., which gives a feeder current of 204 amps., requiring No. 4/0 conductors in the single-phase, 120–240-volt feeder. Thus for the 18-circuit panelboard A we have 113 lb. of branch-circuit copper and 442 lb. for the 225 ft. of feeder, to which must be added 4.5 lb. for the panelboard copper, a total of 559.5 lb. For the three large and three small boards the aggregate copper in the distribution system is 2,331 lb. for Method 1.

The procedure for determining the copper in Method 1 is typical for Methods 2, 4, 6, 7, 8 and 10, all of which follow the first basic plan. With one minor exception, the same procedure applies to Method 9, which uses a neutral balancing transformer, the weight of which must be included in the total copper for Method 9. Methods 3, 4 and 11 follow the second basic plan, with a somewhat different

* An abstract of a paper presented this spring before the Great Lakes Regional Conference, I.E.S.

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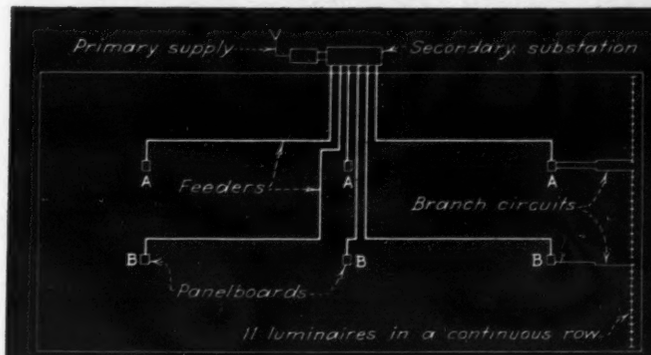

FIG. 1—Basic plan A of lighting distribution system in typical industrial plant; panelboards operate at the same voltage as the feeders

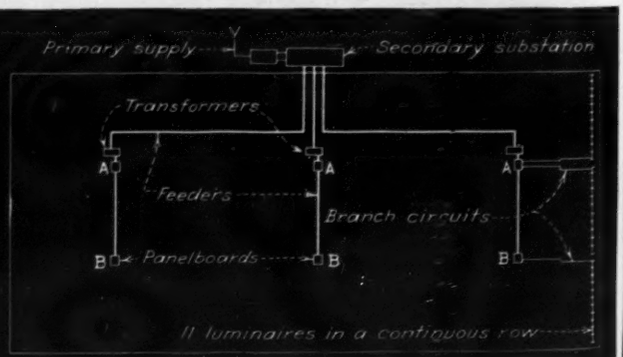

FIG. 2—Basic plan B of lighting distribution system in typical industrial plant; small transformer used to reduce feeder voltage to panelboard voltage

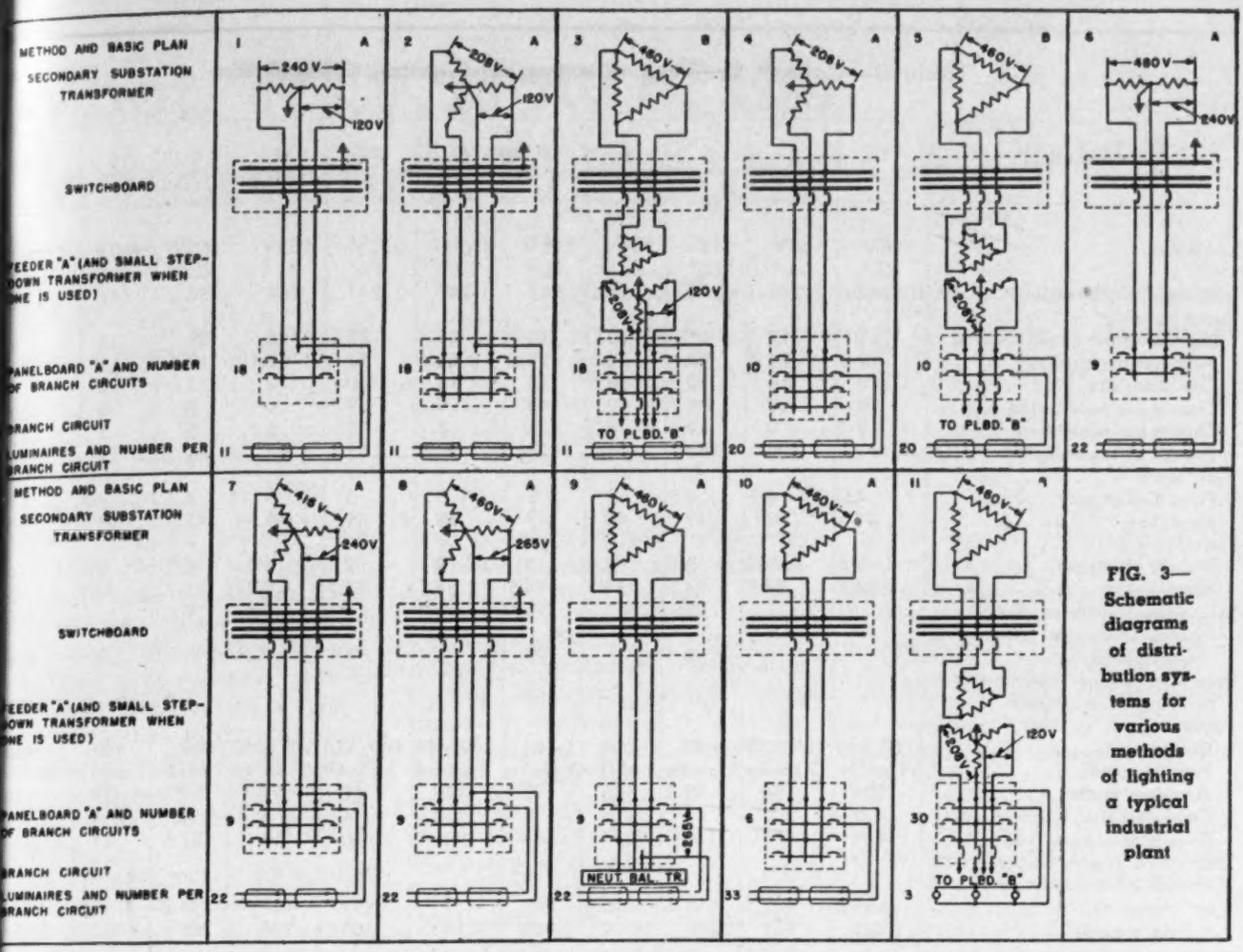
METHOD AND BASIC PLAN
SECONDARY SUBSTATION TRANSFORMER
SWITCHBOARD
FEEDER "A" (AND SMALL STEP-DOWN TRANSFORMER WHEN ONE IS USED)
PANELBOARD "A" AND NUMBER OF BRANCH CIRCUITS
BRANCH CIRCUIT
LUMINAIRES AND NUMBER PER BRANCH CIRCUIT
1 A 240 V 120V 18 11
2 A 208V 120V 18 11
3 B 460V 208V 120V 18 TO PLBD. "B" 11
4 A 208V 10 20
5 B 460V 208V 10 TO PLBD. "B" 20
6 A 480V 240V 9 22
METHOD AND BASIC PLAN
SECONDARY SUBSTATION TRANSFORMER
SWITCHBOARD
FEEDER "A" (AND SMALL STEP-DOWN TRANSFORMER WHEN ONE IS USED)
PANELBOARD "A" AND NUMBER OF BRANCH CIRCUITS
BRANCH CIRCUIT
LUMINAIRES AND NUMBER PER BRANCH CIRCUIT
7 A 416V 240V 9 22
8 A 460V 265V 9 22
9 A 460V 265V NEUT. BAL. TR 22
10 A 460V 6 33
11 B 460V 208V 120V 30 TO PLBD. "B" 3

FIG. 3—Schematic diagrams of distribution systems for various methods of lighting a typical industrial plant

method of determining the total amount of copper.

Method 3 uses 120/208-volt branch circuits and 460-volt feeders with a step-down transformer. The same size conductors are required for the branch circuits as in Method 1. However, the total branch circuit copper is slightly less because a branch neutral can be used with three branch phase conductors in Method 3 instead of one neutral for two phase conductors.

Transformer copper is prorated to panelboards according to load. The short section of circuit between the transformer and the panelboard, being heavier than the feeder supplying the transformer, is considered separately. Total load on the transformer is 73.5 kva., which gives a current of 92.3 amp. in the feeder supplying the transformer. This current requires a No. 1 conductor and the corresponding weight of copper is 467 lb. The total copper corresponding to panelboard A is 521.5 lb. and for the entire distribution is 2,061 lb.

Methods 8 and 9 illustrate an interesting situation. Both use 265/460-volt, three-phase, four-wire panelboards supplying 265-volt luminaires. In Method 8 the feeder circuits are operated as four-wire circuits from the secondary substation, but in Method 9 (see Fig. 3) a small neutral balancing transformer is used to establish the neutral point. This allows the feeder to operate as a 460-volt, three-wire circuit, thus saving the neutral-conductor copper from the secondary substation to the panelboard. However, even though the balancing transformer is very small, it more than outweighs the saving of neutral conductor copper. The total weight for Method 9 is 725 lb. of copper, as compared to 705 lb. for Method 8. Even if there were no practical operating disadvantages for Method 9 there would be no justification for using the balancing transformer.

Table I

Method	Distribution Voltage	Phases	Luminaire
1	120/240	Single	118-volt, 2-lamp
2	120/208	Three	118-volt, 2-lamp
3	460	Three	118-volt, 2-lamp
4	208	Three	208-volt, 2-lamp
5	460	Three	208-volt, 2-lamp
6	240/480	Single	236-volt, 2-lamp
7	240/416	Three	236-volt, 2-lamp
8	265/460	Three	265-volt, 4-lamp
9	460	Three	265-volt, 4-lamp
10	460	Three	460-volt, 4-lamp
11*	460	Three	120-volt, 1-lamp

*One method using 1,000-watt incandescent lamps in Industrial Glass-Steel luminaires was included to indicate the comparison between fluorescent and incandescent systems.

In order to have a guide-point in forming conclusions regarding analyses of the various fluorescent lighting systems studied, an incandescent arrangement, Method 11, was included. It uses 3,353 lb. of copper in the distribution system, or 44 percent more than the copper in Method 1 using fluorescent lamps. This is to be expected because the incandescent lamp load is greater than that of the fluorescent methods.

For distribution system only

Table II—Copper Required in a Typical Lighting System

Method	1	2	3	4	5	6	7	8	9	10	11
Luminaire	118V–2L*	118V–2L*	118V–2L*	208V–2L*	208V–2L*	236V–2L*	236V–2L*	265V–4L*	265V–4L*	460V–4L*	120V–2L†
Volt-amps. per luminaire	247	247	247	247	247	247	247	230	230	237	1,000
Branch circuits											
Luminaires per circuit	11	11	11	20	20	22	22	22	22	33	3
Amperes per circuit	22.6	22.6	22.6	23.6	23.6	22.6	22.6	19.1	19.1	17	25
Conductor size, No	10	10	10	10	10	10	10	12	12	12	10
Circuits per panelboard A	18	18	18	10	10	9	9	9	9	6	30
Circuits per panelboard B	9	9	9	5	5	5	5	5	5	3	15
Pounds of copper (plbd. A)	113	108	108	108	108	93	92	57	57	59	145
Panelboard A											
Pounds of copper	4.5	4.5	4.5	5	5	3	3	4	4	4.5	11
Load, kva	49	49	49	49	49	49	49	45.54	45.54	47	90
Panelboard B											
Pounds of copper	2.5	2.5	2.5	3	3	2	2	2.5	2.5	2.5	6
Load, kva	24.5	24.5	24.5	24.5	24.5	24.5	24.5	22.77	22.77	23.5	45
Step-down transformer, kva	.....	.....	75	.....	75	.....	.....	.....	3	.....	150
Pounds of copper (assigned to panelboard A)	.....	.....	190	.....	190	.....	.....	.....	21	.....	258
Secondary copper—transformer to panelboard A, pounds	.....	.....	52	.....	39	.....	.....	.....	5.2	.....	105
Feeders											
Voltage	120/240	120/208	460	208	460	240/480	240/416	265/460	460	460	460
Type of circuit	1 ph-3w	3 ph-4w	3 ph-3w	3 ph-3w	3 ph-3w	1 ph-3w	3 ph-4w	3 ph-4w	3 ph-3w	3 ph-3w	3 ph-3w
Amperes, feeder A	204	136	92.3	136	92.3	102	68	57	57	59	170
Conductor size, feeder A, No.	4/0	2/0	1	2/0	1	1/0	4	4	4	4	3/0
Pounds of copper, feeder A	442	370	167	277	167	221	116	116	83	87	334
Distribution system copper											
Pounds corresponding to panelboard A	559.5	482.5	521.5	390	509	317	211	177	170.2	150.5	741
Total pounds	2,331	1,831	2,061	1,620	2,009	1,197	867	705	725	603	3,353
Total in percent of Method 1	100	78	88	70	86	51	37	30	31	26	144
Luminaire copper, total pounds	1,740	1,740	1,740	1,740	1,740	1,740	1,740	1,270	1,270	1,600	89
Lighting system copper											
Total pounds	4,071	3,571	3,801	3,360	3,749	2,937	2,607	1,975	1,995	2,203	3,442
Total in percent of Method 1	100	88	93	83	92	72	64	48	49	54	82

*Fluorescent lamps. †Incandescent lamps.

Method 10 uses the least copper, requiring only 26 percent as much as Method 1. The reason for this is that Method 10 uses the highest utilization voltage and the simplest arrangement of circuits, 460-volt, three-phase, three-wire circuits throughout and no neutral conductors. All of the methods using 460 volts in the panelboards (Methods 8, 9 and 10) use considerably less copper than any of the other methods, ranging from 26 percent to 31 percent of the copper needed for Method 1.

However, the ballasts for the fluorescent lamp also involve the use of copper. The amount of copper required in the luminaires for each of the methods is shown in Table II. In Methods 1 to 7, inclusive, two-lamp ballasts are used, for a total of 1,740 lb. of copper. In Methods 8 and 9 a four-lamp ballast is used and the total amount of copper is reduced to 1,270 lb. In Method 10 the luminaire copper is 140 lb. less than that in Methods 1 to 7 because of the higher operating voltage for the 460-volt luminaires. However, the 460-volt, four-lamp ballast must have an auto-transformer element to reduce the luminaire voltage to the lamp voltage; for this reason the luminaire copper in Method 10 is more than that for Methods 8 and 9. The luminaires copper in Method 11 represents the amount used in the mogul socket only.

Considering the total lighting system, the minimum amount of copper required is 48 percent for Method 8. There is a loss in percentage saving of copper, which is due to the fact that nearly the same amount of copper is added for the luminaires in each method. It will be noted that if it were necessary that the luminaire voltage be 120 volts the incandescent lamp arrangement would be more economical of copper than would a fluorescent system.

In order to simplify this discussion the analyses discussed above have been limited to a lighting system entirely separate from any distribution system for manufacturing loads in the plant.

Generally speaking, it will be advantageous to combine the lighting and power systems at least through the secondary substation.

What, Why, How of the Conservation Program

Answers to questions most often asked by utility people give better understanding of the purpose of the program and clear up hazy points as to the procedure and method

TOM P. WALKER, president of the Council of Electric Operating Companies, recently completed a nation-wide tour on which he discussed the forthcoming conservation campaign with many representatives of utility companies. He reported a spirit of co-operation and willingness to make the electric industry's part of the campaign a success evident at each of the meetings of utility people he attended.

Following are some of the questions which Mr. Walker was asked most often in all sections of the country. The answers to them are based on statements of various officials of the Office of War Utilities. These answers are not official statements of OWU, but they represent current OWU thinking on problems posed by the questions.

1. How will utilities find out when to start their local programs?

OWU plans to advise each of its contact agencies, the American Public Power Association, the Council of Electric Operating Companies, Department of the Interior, Edison Electric Institute, National Rural Electric Co-operative Association, Rural Electrification Administration and the Tennessee Valley Authority, that the campaign will start on a given date. These agencies will then inform their membership or customers of the official date. The contract agencies will be informed after a meeting of the Inter-Industry and Inter-Agency Committee scheduled for September 2 or 3.

2. We cannot understand why tungsten is so critical and, if it is, why it cannot be rationed directly instead of through lighting curtailment.

The tungsten supply, being insufficient for essential needs in the same fashion as steel, copper and other materials, has been under strict allocation control (Order M-29) for months. Since not even essential needs can be supplied, the only alternative is to cut down on use. Sufficient quantities of tungsten wire are not available for manufacturing the number of lamp bulbs required for essential purposes. It is therefore necessary to eliminate non-essential use of incandescent lamps.

3. What agency will secure the co-operation of industries and other establishments which have their own power plants?

Such establishments will not miss the activities of local electric companies in promoting their own campaigns, nor will they escape the significance of the federally sponsored blast of publicity. There is no reason to believe that they will want or attempt to evade the rules which are being applied to all other electricity consumers. On this basis it is assumed that establishments which operate their own generating stations will go along with local campaigns and, therefore, no agency has been assigned directly to secure their co-operation.

4. Will some general rule be worked out for contracts covering sign and similar lighting which is to be curtailed and which are now filled under load factor rates?

OWU does not plan to issue any rule or advice on this problem, considering it to be a matter to be worked out between the local companies and their customers.

5. Will the publicity of various participating industries in local communities be co-ordinated, and how?

Local publicity by various participating industries will be co-ordinated in the communities by the local industry representatives to the extent that they choose to work together for a common goal. Such voluntary co-operation is already apparent in many localities. This policy is in keeping with the recommendations of the electric industry task committee, which drew up the industry's program, and has been urged by task committees of other participating industries. Obviously, WPB cannot station a publicity manager in every city served by an electric company or a municipal station to co-ordinate publicity, so the job will have to be done locally.

6. Will any exceptions be made at Christmas time, and is it possible to arrange for additional lighting for "shopping night" shoppers?

No decision has yet been made on whether there will be exceptions at Christmas time. So far as Christmas decorative lighting is concerned, there is no reason now to believe that there will be any deviation from last season's policy of dispensing with decorative lighting. As for extra light for Christmas shopping, decision has not yet been made.

It is not anticipated that exceptions will be made for "shopping nights." Rules set forth in the task committee report are expected to be followed. No exceptions for shopping nights are included in the report.

7. Many heating loads have converted from coal, oil or gas to central steam heating service. Will steam heating companies be in the program?

Steam heating companies as such have not been given a formal place in the program because they serve so small a percentage of the heating load. Most steam heat companies, however, are affiliated with electric companies, and as such will be in the program on the same basis that gas and electric divisions of their companies are. For those independent steam heating companies which exist there will be the same general pressure to join wholeheartedly in the conservation drive that there will be on owners of private generating stations. They will be reached by all publicity directed at heating. No one company will want to be out of step with the whole parade.

8. Will companies in the military dimout areas be expected to participate in the program?

Definitely yes. While companies in these areas are and have been ahead of others in non-strategic areas in curtailing lighting, by no means all of their activities are in tune with the conservation drive. Shading of lights to prevent sky-glow, for instance, saves no fuel, manpower, transportation or tungsten, yet it does fulfill the purpose of the dimout. Daytime lighting is not restricted in dimout areas, but the conservation program calls for its elimination.

9. In making reports on results accomplished, may companies in dimout areas relate their reductions to the period prior to the dimout?

There is not now any definite answer to this question inasmuch as OWU has not yet devised a reporting system for the program. However, the problem undoubtedly will be considered when OWU sets up methods for statement of results of the conservation program.

Draft Deferment of Appliance Repairmen

How to set up group replacement schedules to assure sufficient manpower to keep appliances working — Outline of practical method

GROUP replacement schedules covering all electrical repair and service men in a city or metropolitan area, including those employed by electric utilities and those employed by service establishments or appliance dealers (ELECTRICAL WORLD, August 7, 1943, page 69), constitute the best method yet devised of assuring that there will be sufficient trained workers in a given area to maintain essential appliances at minimum service standards.

Since the filing of such a schedule requires considerable preparatory effort and since the job must be done in strict compliance with regulations of the National Selective Service System, those who have already filed group replacement schedules suggest that the job be sponsored and directed by some agency which has the personnel and the interest to do the job right. In most cases the best agency is the local utility company.

In Washington, D. C., many repair and service men are covered by a group replacement schedule which was promoted and compiled by J. S. Bartlett, director of the Electric Institute of Washington. Bartlett has suggested the following program as one which will result in an accurate schedule.

First step in the program is to establish that the given area has reached a point at which further reduction in manpower would render impossible repair service at minimum standards and that no pool of experienced manpower is available to replace those in the industry who may be called to active duty. Both of these contentions must be proved to the satisfaction of local draft boards before they can consider men for occupational deferment under the terms of Occupational Bulletin No. 31, which establishes certain repair services as essential to support of the war effort and establishes certain jobs as essential occupations in the industry. Since it would be difficult, if not impossible, for a single repair agency to establish these facts, the job must be done for all by an agency which is able to do it.

Local draft boards normally will be convinced of these facts by a survey of a representative portion of the area service establishments which shows that a definite percentage of the service men has already left, that another definite percentage will go when fathers are inducted for military service and that the volume of repair business in the past twelve months has increased by a definite percentage.

Dollars Are Best Measure

Dollar volume is the more accurate figure to show the increase in repairs, inasmuch as the number of jobs handled today is not apt to compare favorably with that handled a year ago. This is due to the inexperience of new men, older appliances to repair, elimination of "in guarantee" calls and the spare parts situation, all of which mean more work but a smaller number of calls. In one area such a survey showed that 26 percent of the experienced refrigerator men had left, that 50 percent of the balance would go when fathers are inducted and that volume would have doubled by the end of the year.

To show that there is no pool of

experienced men available, advertisements which have been run in local newspapers unsuccessfully will help. A check with the local office of the United States Employment Service for experienced help also will establish the absence of such a pool. Of course, this material must be presented to local draft boards in conjunction with Occupational Bulletin No. 31.

Local Organization

Second step is to organize the local repair industry so that information on obtaining deferments can be disseminated thoroughly and help may be afforded in obtaining deferments. Since most managers of small establishments are unable to follow Selective Service and other federal regulations minutely, the knowledge important to them must be spread through an agency which can keep track of developments. Managers must be convinced that they have a definite obligation to the public to keep appliances in operating condition. It will be helpful to point out that contacts made now will be useful to them when appliances are again available. No hesitance about keeping men out of the service need be indulged in since War Manpower Commission has certified repair services as essential to support of the war.

Employers should be notified to file a Form 42A on every man of military age. This form notifies local boards that a registrant is in an essential occupation. It also requires boards to notify the employer when a registrant for whom a 42A has been filed is reclassified or called. Within ten days after receiving such notice, the employer should send a written request for a hearing with the registrant, at which time additional data may be presented. Any appeals must be taken within ten days.

A local training program, aimed at preparing draft-exempt workers for apprenticeship, should be established also, to show local boards that an effort is being made to solve the problem by the use of non-inductable manpower.

Third step is to compile the replacement schedule. When this is attempted, it is necessary for the agency sponsoring the schedule to have from every establishment covered specific designation of authority for the sponsoring agency to act for it.

One of the chief values of the schedule will be in keeping repair establishments informed of their own manpower outlook. Normally, small establishments do little planning, and when too many men have been taken without adequate replacement, they are inclined to close. The replacement schedule will contribute a manpower time-table which will help small establishments avoid this.

Instructions for compiling and filing a replacement schedule may be had from state Selective Service headquarters. The schedule, when accepted, will provide an orderly means of replacing essential workers and will provide deferments of sufficient length to assure replacements of some ability if not replacements of first-class caliber.

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Priorities Note

Case No. 76, "Single Form" and PD-1A Applications (ELECTRICAL WORLD, July 24, 1943, page 59), has been superseded and should no longer be regarded as an expression of standing policy in the Office of War Utilities.

OWU will now accept applications for preference ratings and applications for allotments of material on form WPB-2774, the "single form," and asks that Form PD-1A not be used for these purposes.

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Utility Promotes Safety in Customers' Homes

Is the 7th Column lurking in your home?
Published in the interest of safety in the home by
BOSTON EDISON COMPANY
ZIP YOUR LIP SAVE A SHIP
KEEP ON BUYING WAR BONDS

Recognizing that safety, like charity, should begin at home, the Boston Edison Company uses newspaper advertising space to tell its customers to guard against the too common electrical and other hazards that lurk in the average home.

Women Take Parts of Men's Jobs

Women not replacing men, but a regrouping of old jobs into new jobs makes it possible to retain men on those that require experience, turning over to women the parts requiring little or no experience

R. S. NELSON, President, Gulf States Utilities Company, Beaumont, Texas

OPERATING in a territory where there is a definite and officially acknowledged shortage of manpower, we naturally have had our share of manpower problems. Some have more or less solved themselves.

The shrinkage in construction and maintenance has served to cushion the blows dealt operating departments by the draft boards and other industries bidding for available labor. In other words, as the supply of manpower with certain abilities dwindled, our need of manpower with those abilities dwindled. By skillful juggling of personnel available, by drawing on a department whose activities have shrunk for men to do men's work in other departments, acute shortages have been avoided except in a few spots requiring long training and experience, where overtime, of necessity, has had to take up the slack.

So far replacement of men by women has not taken place in the generally accepted sense. Very definitely, however, employment of women has served importantly to conserve manpower.

Redistribution of Jobs

As a general rule, what has happened and what is happening, so far as our organization is concerned, involves redistribution rather than replacement. Most jobs that have been vacated by men naturally have involved a number of parts, or lesser jobs. Some of the lesser jobs that went to make up a whole job required long experience. Others were strictly a man's work. Some of the parts of the whole required experience easily obtainable among women and some required no particular experience and could be done as well by a woman as by a man.

NEW women employees like outside work

So we have redistributed, or regrouped, what we might call the old jobs into new jobs. Those employees with experience have been given more duties requiring experience and relieved of those duties requiring little or no experience, the latter being grouped and turned over as single jobs to newcomers, most of whom have been women.

In other words, while we now employ many more women than formerly, they have not replaced men in the strict sense that they have in many industries where, for instance, a woman may be hired to operate a lathe formerly operated by a man, and the degree to which the woman replaced the man can be judged simply by comparing the quantity and quality of gadgets produced in a given time.

Ordinarily, of course, meter reading is regarded as a man's work, and in assuming this duty women have released manpower. We formerly used the so-called district representative, or meter reader-salesman plan. These district representatives were trained salesmen, which the women who now read meters are not. However, these women, in addition to reading meters, intelligently perform a number of duties, quickly mastered, which in ordinary times would be performed by men as a matter of course. As a result they are called "customer contact representatives."

Women are making collections formerly made by men in the collection department; it is now our practice to leave meters "hot" in most residences and small commercial installations, and women execute service orders where actual disconnection of service lines is unnecessary, leaving service men more available for the big jobs, the pole-climbing connections and attention to the big industrials.

The number of women employed to read meters amounts to more than 20 percent of the total number of women that have been employed since August 31, 1941. The record shows that the number of women we employed increased from 184 in August, 1941, to 270 as of June 30, 1943, and of these 17 are reading meters.

Outdoor Jobs Appealed

Frankly, we were agreeably surprised to find that the idea of being outside appealed to so many women of the high type we were seeking. Some of the women employed had never worked before, and do not of necessity have to work now, but they

had always liked to putter around outside in their yards with their flowers and decided they'd like to do something more to aid the war effort. Others were glad of an opportunity to get away from confining, not-so-well paid jobs. There is the case of the woman with five small children. When she applied we explained that the job involved several miles of walking daily, in all kinds of weather. She told us that a few miles a day in any kind of weather, 40 hours a week (which was our working schedule then), would be agreeable to her, as the job she was leaving with a non-essential industry called for nine- and ten-hour days, six and a half days a week on her feet in sweltering surroundings, with the pay considerably less than our offer.

No Regimentation

We have made no effort to "regiment" these women. That is, we do not uniform them; set hard and fast rules as to what they shall wear in fair weather or foul. Before we got around to making decisions in the matter, we found that they had solved their own problems in these respects. One showed up in a walking shoe which she recommended highly. It was adopted by the others. Another achieved the same results as to a windbreaker. Raincoats are perhaps not identical, but generally similar. They're getting a kick out of their jobs. Use bicycles to get around on. Phone in at regular intervals along their routes to find out if any job has come up since they left the office which they can handle while in that neighborhood.

By far the majority of women who have been employed as a result of the war's drain on manpower have been employed for accounting and clerical work.

Here is the detail for the company:

Women Employees

	June 30, 1943	Aug. 31, 1941	Inc.
Accounting	165	113	52
Secretaries and stenographers	52	57	—5
Files	18	14	4
Meter readers	17	0	17
Distribution dept. clerks	6	0	6
Engineering clerks	3	0	3
Station clerks	4	0	4
Meter shop helpers	4	0	4
Appliance repair shop helper	1	0	1
Total employees	1,273	1,640	
Percent of women employees	21.2	11.2	
	270	184	86

Fortunately, in our case, and probably the same is true with other utilities, we had a considerable reserve of experienced womanpower to call upon when the emergency arose. This reserve consisted of former women employees who in years gone by had resigned to marry and manage homes and husbands. Many of these returned out of a sense of loyalty to the company and their country. Others, with husbands in the service, had the added incentive of making needed money.

Business Experience

These former employees were given preference. Women with any business experience and husbands away at war were second choice. Then, in order, young women with business schooling but no experience and those lacking in both.

How long we will be able to continue to say, as we have here, that women are not taking over men's jobs in the usual sense in our organization, but only parts of men's jobs that can be done as well by women, remains to be seen. Certainly the end of increasing employment of women is not in sight. More are being employed every day as the shortage in manpower causes further shifting of manpower and responsibilities in the operating organization.

However, as there is a growing awareness apparent among those managing various branches of the war effort that our business must go on if we are to win the war, and that it can't go on without the services of those trained to keep it going, we believe that we will be encouraged and permitted to retain the trained personnel essential to operations. There is evidence, we think, a better understanding of the fact that the manufacture and delivery of dependable electric service requires experience and knowledge which cannot be acquired by a man or woman in a three-week course. We have practically reached the irreducible minimum in manpower in certain vital departments. To reduce it further would definitely jeopardize continuity of service, not because it's manpower but because it's experience. In other directions it is desirable not to have a further drain, but not vital to continued operation. Women can and will be employed to close these gaps if necessary and with close supervision vital services will not be affected.

Extension of the work week to 48 hours to include all departments has materially helped the situation.

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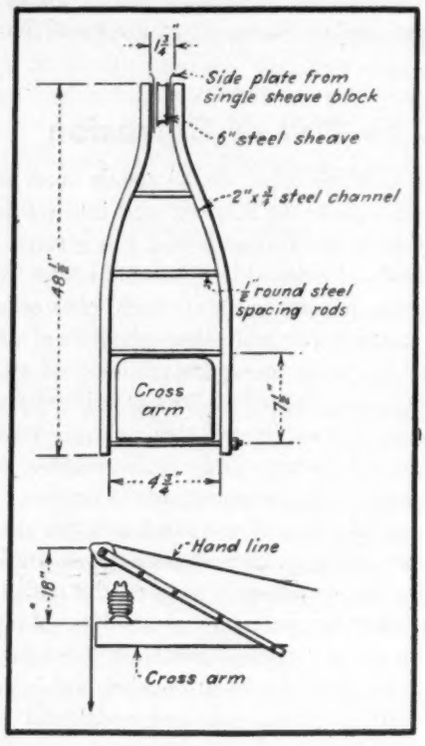
Wire Gin Raises 66-Kv. Conductors

Shown is an angle-iron gin used by the Kansas Gas & Electric Company's transmission construction department for raising conductors into position on post- and pin-type insulators. This type of gin has been found particularly useful on long transmission spans where the weight of the conductors is a considerable load for one man to lift and pass around the end of a transmission crossarm.

By slipping the gin over the arm and allowing it to rest at an angle as shown, the conductor can be raised conveniently with a hand line either from the ground or by the lineman from a safe and comfortable working position.

The gin clears the crossarm by 18 in., giving 2 in. clearance over line-post type insulators, the tallest insulator likely to be encountered on the system.



Editorials

S. B. WILLIAMS, *Editor*

We Indulge in Innuendo

WATCHING THE FRACAS centering around the aims and purposes of the National Rural Electric Co-operative Association, now developing into pretty much of a free-for-all, one is tempted to quote the old adage that states a condition in which honest men prosper. But that would be unfair, because all those mixing in the melee do not deserve the characterization that would be thus bestowed. Some of them are of our own belief and temper; others must be recognized as sincere followers of mistaken faiths; it is not necessary to particularize in regard to those remaining. However, to utility people and members of co-operatives who have read the articles by Judson King and Clyde Ellis (*Public Utilities Fortnightly*, July 8 and 22) we commend, if only for its trenchant adjective, the story "REA Tangle Awaits Congress Investigation" in the August number of the *Journal of Electrical Workers and Operators*, official publication of the International Brotherhood of Electrical Workers.

The Toll of Corrosion

CORROSION of buried metals takes an enormous annual toll—probably running well into millions of dollars each year in the United States. For electric utilities with thousands of miles of lead-covered cables, conduits, piping systems around plants, steel penstocks, tower footings, counterpoise and other grounding materials the cost of corrosion is an important item. More serious in the end than the direct loss now in critical materials may be the cost of plant depreciation, corrosion detection and repairs, reconditioning and replacements, loss of protective grounds and interruptions to service.

Much of this corrosion is the result of promiscuous use of many different metals connected together and forming active galvanic couples, the moist soils or water providing the necessary electrolyte. Many electrochemically dissimilar metals—cast iron, galvanized steel, copper and brass, steel, lead—are buried and interconnected through various intentional and accidental contacts. It is not strange that corrosion takes place. In fact, it is more of a wonder that the vulnerable metals last as long as they do.

Copper and brass in buried locations are protected at the expense of corrosion of the other metals because of the electrolytic cell action. For example, the galvanized tower footings may be eaten away in the process of protecting the buried counterpoise or the copper ground wires and rods around stations.

Something should be done to reduce this avoidable waste of metals and upkeep money. Perhaps the answer will be the development of non-corrodable metals at moderate cost. Plastic or non-metallic pipes present considerable promise, but they are non-conductors of electricity and thus complicate the effort to ground electric systems for the sake of reducing hazards.

Corrosion can be reduced by avoiding, where practical, indiscriminate use of different metals, or by electrically insulating one from the other. Perhaps cathodic protection will become generally used to reduce or stop corrosion. It is beyond the experimental stage and its use is spreading, principally on pipe lines.

The need for some sound thinking, engineering investigations and close co-operation seems to be indicated, to arrive at a solution for the maximum benefit of all.

Sir Hubert Still Mute

ALTHOUGH there is no official recognition by award of flag and emblem, like the Army-Navy "E," to electric utilities for outstanding excellence in war production, the desirability of something of the kind is pointed up by various apparent efforts to compensate for its lack.

The Navy recently cited the San Diego Gas & Electric Company for "meritorious wartime service." Other more or less official recognitions of utility performance in various phases of wartime activity have been made.

Now comes another manner of giving credit to utility people. It is that taken by the Copperweld Steel Company on the occasion of the "E" award to its Glassport plant. An advertisement was published in the Pittsburgh newspapers announcing the award and saying, "This coveted honor we gladly share with the public services that helped us win it." The text names the utilities concerned, Duquesne Light, of course, among them, and points out that they are "quietly and effectively doing their parts . . . in the face of overloaded facilities and shortages of men and material."

Others give credit to the utilities as best they may, but OWU hangs back from taking official notice of exemplary performance. Objection to the suggestion of a service "S" has been that all electric utilities are doing such a good job it would be unfair to single out any for commendation. The question is raised of how to set up any distinction on which to base an award. Possibly some guidance toward its answer can be found in Illinois, where for many years the regulatory commission has used a method for quantitative determination of electric utility performance.

"My Own Judgment"

In view of this sharp conflict between the House and Senate committees and in view of the failure of Congress to take any action to determine the matter, I feel that I am not only at liberty to determine my course of action on the basis of the strict legal situation, I am under a duty to follow my own judgment as to the best policy to be pursued.

CONSIDERING the intentions of the Secretary of the Interior as stated in our "Washington Comment" of August 21, it is not remarkable that his "own judgment" was that construction of the Shasta-Oroville transmission line should be continued, even though Congress had not authorized it and the principle involved in its construction is expected to be a matter for debate and vote when Congress reconvenes.

The quotation is from a letter of the Secretary replying to a telegram sent him by Albert E. Carter, Republican representative from California. Congressman Carter, ranking minority member of the House subcommittee on interior appropriations, had characterized the resumption of construction of the line as a betrayal of the expressed recommendations of the subcommittee.

Here is the old technique of do-it-while-they're-arguing-about-it, by means of which so much—of good or bad, depending on the viewpoint of the beholder—has been accomplished in these later years. Effective as this technique may be, and there is no doubt that it is effective, it is no part of the theory of representative government. It belongs in another kind of government, a kind of government Mr. Ickes would say, undoubtedly has said many times, he abhors and detests.

Words in Rebuttal

ON AUGUST 7, last, a "you did, too" reply was made by counsel for the Federal Power Commission to the respondent utilities' brief in the commission's inquiry on rates for electricity delivered to the Lake Catherine aluminum plant. The reply brief merely reiterates the charges contained in the original presentation and tries to uphold them by attacks on the good faith and on the integrity of the utilities' witnesses and arguments.

According to the reply brief, the utilities pursue an "unbridled course." They "blithely state" what is untrue. They "unblushingly ignore" patent facts. They show a "flagrant disregard" for the good and the true. Their argument has a "crowning vice" and is "unjustified and unreasonable."

The evidential weight of adjectives and adverbs should be zero in any kind of court, even in an FPC hearing, but their value in selling arguments and ideas is high and they certainly do enliven the proceedings, both verbal and written. On this score one must give the reply brief a pretty good rating. One must admire the skillful use of these lurid splashes of adjectival and adverbial color by the commission counsel. Not too freequent, not too many, these splashes, but just enough to hold the reader, to make him enjoy each one as he comes to it and to look for the next with anticipatory relish.

Yet one's admiration for the literary competence of the brief is marred once or twice by a "flagrant disregard" (inevitably one is infected) on the part of the authors for the rule of rhetoric that condemns redundancy. They speak of the "true facts" as if there were untrue ones. Well, possibly; these lawyers . . . .

You and Me Both, Brother

IN FRONT of the *World-Telegram* office in New York City pace two National Maritime Union pickets carrying large placards, while others offer pamphlets to the passers-by. The placards and the pamphlet denounce Westbrook Pegler and the newspapers that print his essays on racketeering in labor unions. Much of the space in the pamphlet is devoted to the story so widely circulated early this year of how union seamen refused to work on a Sunday unloading cargo at Guadalcanal while battle-weary Marines hauled the much-needed supplies ashore.

The burden of the N. M. U. complaint is that the newspapers played up the story in big front-page headlines and then, when it was officially refuted later, buried the denial in the back pages or did not print it at all.

To the National Maritime Union the electric utilities extend the hand of sympathy. They, too, know what it is to suffer calumny and despite, built up of headlines. They, too, know what small heed is taken in the public prints of any later refutation.

But it did the electric utilities not a bit of good to boil with indignation at such scurvy treatment, nor will it profit the N. M. U. to rail against the newspapers. That such things be is not the fault of the newspapers. They merely reflect humanity at large. And before newspapers were known, men's ears were avid for the accusation, but remained deaf or almost to the proof of innocence. That old Roman satirist, Juvenal, said it well,

> "And there's a lust in man no charm can tame
> Of loudly publishing our neighbor's shame.
> On eagle's wings immortal scandals fly
> While virtue's actions are but born to die."

And, deplorable as it may be in specific instances, this is as it should be. Heaven forbid this nation ever sees the day when anything more than decency and the law of libel are a general check on the printed and spoken word. It is of the very essence of freedom of speech that charges be aired publicly. Not otherwise can public indignation be aroused and its salutary effects secured.

That injustice is done in some instances is admitted. The electric utilities suffered greatly. So now does the National Maritime Union. So have millions of men and causes in the past. So will millions more in the future. But in a free nation men will never stop shouting charges and men will never stop listening. And no free man wants the shouting and the listening to stop.

Washington Comment

By R. N. LARKIN, Washington Correspondent

National Service Act Coming?

WILL the United States go through the war without a national service act, under which men and women would be directed to their places in the war effort, or will it, too, join the parade of warring nations which have found it necessary to abrogate individual freedom of work and enterprise for the national welfare?

The question has been put to the nation spasmodically for a year or more. It appears now to be here in real earnest.

Washington will not presently admit that there can be no escape from such an act. Officials insist that they prefer to do the job otherwise. Manpower developments of the last month —particularly the new critical and non-deferrable job lists of War Manpower Commission (ELECTRICAL WORLD, August 21, 1943, page 71)— bear out these protestations.

Some have been arguing for a national service act for months. Sen. Warren R. Austin, Vermont, and Rep. James W. Wadsworth, New York, a pair of Republican Congressional veterans, introduced one last winter. One common argument for such legislation is that if young men can be drafted to fight in the hellholes of the world, stay-at-homes can certainly be drafted for profitable work in war plants. And besides, runs another argument, the British have done it successfully, and they treasure individual freedom as highly as we.

Congress Must Vote It

Of all the considerations which will finally determine whether we are to have a national service act, probably none is quite so important as whether or not Congress will vote one. Certainly the fact that such an act may be needed will not be so determining as will the votes on the floors of Congress. A sensible tax structure has been needed for years, but few people who know taxation or finance will argue that we have such a structure.

It is probably true that Congress will vote a national service act reasonably soon after it is convinced that the voters either want or will support one. Congressmen vote with sectional, partisan or personal bias on many issues, some of them highly important, but they do not seem likely to do so on such a drastic matter.

It is a reasonable assumption also that a national service act will not be sought by the Administration or its war program chiefs unless it just has to be. WPB, being charged with responsibility for making the tools which we and our allies will need to win, has every interest in the matter of manpower, even though it has not the responsibility for providing it. WPB's top men are wrestling with the problem today, trying to determine whether the plateau on which war production has rested since April is the real limit of the nation's productivity, under present plans for 11,000,000 men under arms, or whether it is a false plateau—caused by optimism, hot weather, lack of laundry facilities or design changes —up from which we can climb to new heights.

More Facilities if Needed

If it be the real, ultimate plateau, the answer can only be manpower. If it were facilities, more could be erected. The government has built about $39,000,000,000 worth of industrial facilities for this war. If more were vital to winning the war, or even to shortening it appreciably, would it hesitate to add them?

Nor, if the plateau be the end of the line, is it apt to be due to insufficiency of materials. Admittedly we could use more steel or more copper, or more plastics or more of almost any raw material one could mention, except pig aluminum or magnesium. But in the absence of a full knowledge of the materials and manpower situation, which is not available to laymen, it is inescapable that in large measure much of the materials drought is due to a shortage of manpower. High WPB men say bluntly that the country could produce much more copper if more miners were available. At least seven aluminum plants are down for want of labor. Most major steel-making centers in the land are listed as areas of critical labor shortage. The services are pulling war contracts out of the northwest in an attempt to drive workers into the plane plants. WMC broadens its non-deferrable job list and assures, so far as it possibly can, occupational draft deferments to workers in 149 other jobs. An Administration committed to a "hold-the-line" economic policy based largely on wage freezing has failed to blast WPB's hopeful talk of "incentive" wage payments aimed at increasing individual productivity. These facts shriek the conclusion that if we have reached the ultimate plateau of war production, it is because of a manpower shortage.

Worker-Control Devices

A variation of the "Buffalo plan" is slated for installation in the country's tightest labor market very soon in an attempt to find the workers who must be had if the 1943 production goals are to be approached. The Buffalo plan ties WMC's mandatory worker-control devices (certificates of availability, all hiring through the United States Employment Service, prohibition against hiring workers who change jobs for more money, etc.) to a system of manpower priorities which allows workers to be referred to jobs by USES only in accordance with essentiality of local industries, as determined locally.

Perhaps the production plateau is a false one. WPB's head men hope so and probably many of them think so. Their activity along the lines of incentive wages and other schemes to boost individual productivity indicates that they have not given up hope.

If production does not rise off its plateau soon, however, there will be only two alternatives left, a cut in production schedules or an increase in manpower such as could be obtained only by a national service act.

NEWS OF THE WEEK

Fight Income Tax Return Evidence in Rate Hearing

Introduction by Army counsel of tax return of Washington's Capital Transit Co., as evidence in rate hearing, seen setting disturbing precedent in utility rate cases

The legality of an attempt by officers of the Judge Advocate General's Department, U. S. A., to introduce in evidence offered at a rate hearing the 1942 income tax return of Washington's Capital Transit Co. is before the Interstate Commerce Commission after having been denied by Commisisoner William J. Patterson.

Army Asks Ruling

E. Barrett Prettyman, attorney for Capital Transit, objected on two occasions to introduction of the return, charging that the strictly defined procedure under which returns may be introduced was not followed by the Army in this case. He was sustained by Commissioner Patterson, who ruled that only that part of the return which had a definite, demonstrable bearing on that part of Capital Transit's operations which are in question was admissible. The Army then asked a ruling by the full commission on admissibility of the whole return.

In a statement to ELECTRICAL WORLD explaining the significance of the attempt to make income tax returns of public utilities generally available as evidence in rate cases, Mr. Prettyman said:

"If the time has come when any government agency can throw in an income tax return as evidence in routine fashion, utilities ought to know about it."

The matter arose when the Army and Navy departments brought action before the ICC in an attempt to obtain lower fares for workers in the Pentagon and Navy Annex buildings across the Potomac River from Washington. Four transit companies, three of them from Virginia, are involved. Service officers blamed some of the high turnover rate of lower-paid employees at the two outlying buildings on the high bus fares. In an attempt to show that Capital Transit could reduce its fare without endangering its financial position, Col. Elbert M. Barron and Capt. Paul S. Davis, the latter an attorney for the Securities and Exchange Commission before entering the Army, attempted to introduce Capital Transit's 1942 income tax return.

SURPRISE—At the company's annual clambake recently president G. H. Niemeyer of Handy & Harmon, surprised employees with the announcement that the firm had just been given its second "Star" award for production achievement

Defines Procedure

Prettyman explained that returns may be introduced as evidence in legal proceedings only under these circumstances: The head of an executive department of the government, finding a valid need for a return, must ask for the return in writing from the Secretary of the Treasury, including with the request a detailed set of reasons. The latter, on his own discretion and after careful consideration of the facts, may direct that the return be made available.

Prettyman pointed out that he was not challenging the executive order allowing this, nor the regulations governing the procedure established by the Treasury, but argued that in this case the request had not been studied by the Secretary of the Treasury in conformity with the rules. To back up his point, he cited the following remark made by Colonel Barron when the first objection was made:

"I might again submit that this is ordinary, routine practice for the War Department; it has been doing this before administrative tribunals right along and never any question raised."

Prettyman attacked an exhibit which was to show that the procedure freeing the income tax reports had been followed. He said the letter was merely one from Internal Revenue Commissioner Guy T. Helvering attesting that the copies of the return were true copies. The Army still has not established, Prettyman insisted, that the Secretary of the Treasury acted with proper judgment as required by the executive order.

Prettyman's objections were con-

sidered particularly significant inasmuch as he served for some years as chief counsel of the Internal Revenue Bureau. He told ELECTRICAL WORLD that in the past Internal Revenue guarded "jealously" the right to release information contained in tax returns. When returns can be made public with little difficulty, he pointed out, the disposition of the filer to include confidential data is lessened.

See Precedent Established

Washington attorneys who followed the case agreed that it marked the first time in their memory that income tax returns had been introduced in a rate case under the executive order cited by the Army as authority. It was generally agreed that if the Army's attempt were upheld, the Office of Price Administration or any other federal agency concerned in a rate case could bring in income tax returns as evidence in routine fashion and thus "violate the provisions of the law which provide security for income tax returns except in carefully defined, specific cases."

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Utilities to Train Army Crews in West

Electric service companies in eight western states will help military authorities as much as they can to train the crews of the latter in the proper care and handling of electric systems in army posts and navy stations as part of the utilities' wartime aid program, according to E. F. Pearson, Northwestern Electric Co., Portland, Ore.

Mr. Pearson will serve as program co-ordinator between military authorities and electric companies in Oregon and Washington. He has been in charge of Northwestern's defense activities since Pearl Harbor.

Each company will work out its own program with the military establishments. Mr. Pearson pointed out that the engineering advice and physical assistance outlined in the aid program already are being given by the companies on an individual and unorganized basis.

Under the aid program electric companies will help restore service on military electric systems in cases of emergency and will help military authorities survey operation and maintenance needs of these systems. This survey is expected to free much critical electrical material which otherwise might be frozen in duplicating reserve stocks. Army authorities in turn will make their crews and facilities available to electric companies in case of disaster.

Southwestern Power Agency Organized

Douglas Wright Named Acting Administrator

Interior Secretary Harold L. Ickes established the Southwestern Power Administration this week to sell power from the Norfork, Pensacola and Denison dams recently placed under his jurisdiction by President Roosevelt (Electrical World, August 7, 1943, page 68).

Douglas Wright, formerly special representative of Federal Works Administrator at the Pensacola project, was named acting administrator of the new agency, which is similar to the Bonneville Power Administration (ELECTRICAL WORLD, August 28, 1943, page 6).

The new agency will maintain an office in Tulsa, taking over the FWA office out of which Wright operated Pensacola Dam and sold its power. An Interior Department spokesman said there would be little increase in the office personnel, estimated at about 200 persons.

The new agency will follow policy laid down by Secretary Ickes through the Interior Department's power division, headed by Acting Director Arthur Goldschmidt. It took over operation of the Pensacola Dam and the sale of its power September 1.

Ickes announced the new organization a day after the issuance, by the President, of an amendatory executive order clarifying that which gave jurisdiction over the three dams to Ickes. Goldschmidt explained that the new executive order merely assigned specifically to the Interior Department jurisdiction over certain unfinished phases of the three projects.

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OPA Files Petition On Detroit Rate Cut

The Office of Price Administration, through its Detroit district office, has filed a petition with the Michigan Supreme Court asking that body to reverse a Michigan Public Service Commission ruling holding that the commission had no power to exclude excess profits taxes as operating expenses of the Detroit Edison Co.

Contending that inclusion of the taxes is contrary to the price stabilization program, the OPA had joined the city of Detroit some months ago in a petition asking the commission to reduce the rates of Detroit Edison by some $8,000,000 annually.

The commission recently ruled in favor of the utility company and the city of Detroit appealed the case to the Supreme Court. OPA's action is in connection with this appeal.

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Niagara Hudson to Cut Rural Rates

A liberalized rural electric line extension plan to assist rural customers in their wartime food production efforts was filed last week by Niagara Hudson System companies with the New York Public Service Commission, according to Earle J. Machold, president of Niagara Hudson Power Corp. The plan was originally intended as part of the system's post-war program on rural electrification, but the critical food situation made its adoption at the present time advisable, the company said.

Under the plan, farmers living within the area served by the Niagara Hudson system whose farms meet WPB requirements may obtain rural electric service by paying a minimum monthly charge of $2. In effect, this means a rate reduction to those farmers now paying minimum charges in excess of $2. After a five-year period the farmer's minimum monthly charge is reduced to the regular service classification. Under present schedules, depending on the length of the extensions, the minimum monthly charge ranges from $2 to $4.50 for a five-year period, after which the minimum reverts to the service classification. In addition, at present, farm customers are required to make contributions toward the construction of line extensions beyond 2,000 feet. The new plan reduces to $2 per month on single-phase service all guaranteed minimum monthly charges now in effect in excess of $2 for the unexpired portion of the five-year guarantee period.

The plan is expected to help offset the farm labor shortage by bringing the benefits of electricity to many farms at present unserved.

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Asks Rise in Electronics Equipment Production

Dollar value of electronics equipment produced monthly must be increased by almost $100,000,000 between now and the end of the year to meet rising production schedules, according to Director Ray C. Ellis of WPB's Radio Division.

Military output of electronics equipment in July totaled $234,000,000, Ellis said. It must rise to $333,000,000

monthly or $4,000,000,000 yearly by December 31 to meet schedules. During 1944, Ellis declared, production schedules call for a 30 to 40 percent increase over this year's level.

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A. P & L. to Lease Hot Springs Plant

Arkansas Power & Light Co. has applied to the Arkansas Utilities Commission to approve a lease entered into with the Hot Springs Electric Co. for a 35-year lease on its electric generating and distribution system in Hot Springs, Ark., fifth largest city in Arkansas.

The lease provides for $225,000 annual rental on the Hot Springs properties, of which $25,000 a year is to be set aside into a depreciation fund. The power company has an option to buy the properties for $2,000,000 under terms of the lease.

The Hot Springs system includes a natural gas-fired generating plant, with 5,250 kw. capacity, and about 7,000 customers. Arkansas Power & Light is tied into the system now and serves for standby. A. P. & L. serves hundreds of rural customers all around Hot Springs. The company's two hydro dams, Carpenter and Remmel, are near by.

Hot Springs Electric is a subsidiary of Cities Service.

New OWU Order Certifies Temporary Connections

U-1-g expected to save paper work in providing for automatic certification of extensions to render service to temporary buildings, where material cost is less than $1.500 underground and $500 above ground

A new order—U-1-g—and an amendment to an existing order were issued this week by the Office of War Utilities.

U-1-g provides automatic certification for temporary service connections which meets its conditions and is expected to save considerable paper work on the part of utilities and OWU alike. It provides that in spite of the provisions of paragraph (h) (1) of Order U-1, extensions to render temporary electric, water and gas service to serve temporarily placed construction equipment or temporary business, civic and recreational facilities may be erected when:

1. Cost of the materials is less than $1,500 underground or $500 aboveground.

2. Such extensions will be dismantled at the end of 90 days from the date of installation and all materials will be salvaged and returned to inventory.

3. No other utility can do the job with smaller use of materials.

Appeals from the restrictions of U-1-g should be made on form WPB-2774.

Paragraph (e) of Order U-1-c, covering rural line extensions, was amended to allow the use of such composite conductors as Copperweld, Amerductor, ACSR and others for primary lines provided the material is available in the excess inventory of a utility and is of a conductivity equal to or less than that of No. 4 copper conductor.

Other Amendments

Paragraph (f) of U-1-c was amended to allow an additional 25 pounds of non-ferrous metal to be used in secondary connections from transformers already installed and in service. This is in line with the provisions of Order U-1-f (ELECTRICAL WORLD, August 28, 1943, page 3) and is aimed at allowing for the weight of metal normally used in a transformer.

Two new paragraphs, (h) and (i) were added to U-1-c, the former clarifying the provision that construction in excess of $500 for materials is not permitted and the latter emphasizing that service can only be rendered by that party which can do so with the least use of materials.

RURAL CO-OP SPEAKERS—Snapped at the second annual meeting of the Illinois Electric Co-operative's Association held recently at Springfield, Ill., were (left to right) James M. Barnes, Administrative assistant to President Roosevelt; G. Wayne Welsch, president of the co-operative, and William J. Neal, deputy administrator, Rural Electrification Administration. Barnes described rise of farm electrification from estimated 750,000 receiving service in 1935 to 2,300,000 today

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Appoints Post-War Planning Committee

In a joint announcement by president Paul B. McKee and vice-president and general manager George T. Bragg, Pacific Power & Light Co., Portland, Ore., issued August 17, a post-war planning committee was named consisting of the following:

D. B. Leonard, commercial manager (chairman); H. W. Millay, assistant treasurer (secretary); Charles M. Sanford, assistant general manager, Oregon; D. F. McCurrach, assistant general manager, Washington; H. W. Derry, manager new industries department; George B. Bocarde, administrative assistant, general superintendent's office; H. Jonas, advertising assistant.

War Regulations Occupy Northwest I.A.E.I. Meeting

Papers cover code problems, post-war planning, public relations and safety, substitute materials, synthetic rubber, arc welding, lighting and other subjects — Stayner new president

The National Electrical Code is more a compromise of judgments and experience than it is a compromise of commercial interests, Victor H. Tousley, secretary of the I.A.E.I., told inspectors gathered at the 17th annual meeting of the Northwestern Section, I.A.E.I. at Seattle, August 26 and 27. The remark was occasioned by a paper by S. B. Williams, editor of ELECTRICAL WORLD, read in his absence by Henry W. Young, Portland, Ore., in which Mr. Williams posed the "commercial interest" charge and pleaded for more basic standards on which to base code rules to make it truly "a minimum standard to provide reasonable safety."

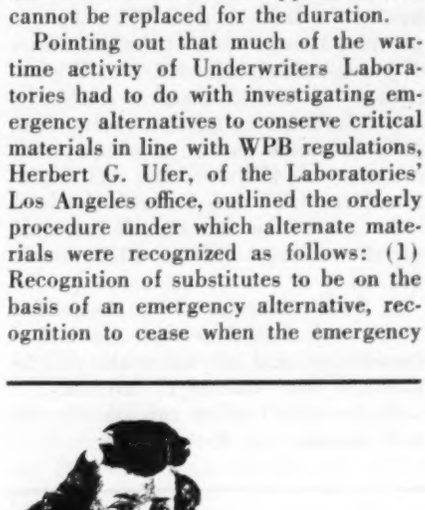
A scientific investigation of the frequency and severity of the experiences which are compromised in code making, the Williams paper said, would give us a better understanding of the reasonable safety the code attempts to insure a unity of safety against which to apply reasonable safety factors. Mr. Tousley pointed out that many parts of the code had been developed on basic scientific facts, but admitted that much of it had evolved from the judgments of men who had worked with code rules over a period of nearly fifty years. He doubted that any single line representing a unity of safety across the broad field of electrical practices could be drawn, no matter what methods might be employed to draw such a line.

Post-War Problems

Post-war problems should be the first consideration of the association, said T. W. Bowry, International president, from Richmond, Va., in his presidential address. Some of these problems the association now should begin to sink its teeth into are: Should the I. A. E. I. take a positive stand for or against sales control; should we have universal inspection laws; what should be done about the accumulation of uninspected work during the war emergency; why the inspector is interested in the increased use of electricity; should we adopt, as a requirement for licensing, standard examinations for contractors and wiremen; what to do about wiring owned and operated by government agencies, without inspection.

The report of the public relations committee by Capt. Stephen E. Sanislo, Seattle fire department, emphasized the fine work done in the past year by the electrical utilities, both private and public in the territory, in educating the public on the safe use of electricity and the conservation of their appliances that cannot be replaced for the duration.

Pointing out that much of the wartime activity of Underwriters Laboratories had to do with investigating emergency alternatives to conserve critical materials in line with WPB regulations, Herbert G. Ufer, of the Laboratories' Los Angeles office, outlined the orderly procedure under which alternate materials were recognized as follows: (1) Recognition of substitutes to be on the basis of an emergency alternative, recognition to cease when the emergency is past; (2) recognize whatever substitutes are formally announced as emergency alternatives in the federal specifications, thereby avoiding duplication of industry consultation; (3) be certain that the Federal Specifications Board and its priority contacts agree as to the existence and extent of an emergency before announcing amendments to our standards.



CONSERVATION AD—Dayton Power & Light Co. is using this striking advertisement to plug the merits of conserving electricity, according to Herbert H. Webb, assistant to the vice-president of the company

Welding Report

Concluding an excellent paper on the characteristics of and developments in a.c. welding, Verne B. Wilfley, Westinghouse Electric & Manufacturing Co., Seattle, put in a plea that the next code revision include a coverage of a.c. and d.c. arc welders and resistance welding, and commended the report of the special technical committee appointed by the electrical committee on this subject, which has proposed a new Article No. 630 to cover the subject. Some revisions of the proposed article were suggested. Developments in d.c. welding were outlined by J. R. Morrill, Lincoln Electric Co.

A report on the status of synthetic rubber production by E. S. McConnell, U. S. Rubber Co., was optimistic. It stated that the first two years objective outlined for synthetic manufacture would probably be reached. Although natural rubber is initially superior to synthetic in most performance characteristics, synthetics are superior in resistance to most influences that cause deterioration. We will be able to continue to make wires and cables which will give satisfactory performance and which will permit inspection bureaus to maintain the standards of safety to which the public has become accustomed, Mr. McConnell said.

In a night session given over to lighting, Walter E. Potter, lamp department of General Electric Co., displayed and explained a number of new light sources being applied to war uses and for post war civilian application. A large post-war field for cold cathode lighting after the war when restrictions were lifted was prophesized by Leon F. Moore, Electrical Products Consolidated, in a paper outlining recent developments in this field.

Stayner New President

Concern was expressed by the group that temporary abandonment of the mandatory provisions for type S fuses in the 1940 code might be made permanent. A resolution urging the electrical committee to rescind the emergency ruling and reinstate the mandatory dates for requiring this type fuse was passed.

At the final business session J. Hyde

Sayner, Utah Power & Light Co., was elected president to follow W. R. Volkye, chief state inspector for Oregon, who had held the office for the past year.

Other elected officers were: First vice-president, Harry Hilpert, I.B.E.W., Seattle; second vice-president, H. E. Chambliss, Montana Power Co., Great Falls; secretary-treasurer, F. D. Weber, Oregon Insurance Rating Bureau, Portland. Mr. Weber was also named as the section representative on the electrical committee and representative on the I.A.E.I. executive council. The alternative on the electrical committee will be L. W. Going, chief electrical inspector, Portland.

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Iron, Steel Men Get Coal Priority

Appalachian region coal operators have been ordered by Solid Fuels Administrator Harold L. Ickes to supply the needs of the iron and steel industry and other vital metallurgical users before filling other orders.

The plan, developed by a producers' committee and issued as Solid Fuels Regulation No. 4, provides also that producers shall reduce shipments to customers in other use categories on a pro-rata basis when necessary to fill the needs of the two favored users, and that coal producers shall attempt to secure greater reductions than those imposed by the pro-rata distribution plan on users who have ample stockpiles.

Under the regulation, producers in bituminous districts 1, 2, 3, 4, 5, 6, 7 and 8, the Appalachian region, are to fill metallurgical orders first, then those of customers in the Lake region. Where production is less than requirements, the solid fuels administration will apportion the deficiency to be filled by various districts.

Purchasers and producers are urged to agree to reduce pro-rata shipments to those having on hand more than a "reasonable number" of days' coal supply. SFA may define the term "reasonable number" as often as necessary to keep the plan intimately in touch with coal supply, and may, when necessary, prohibit or restrict shipments to certain classes of customers. No person shall be liable for default on any contract as a result of compliance with the regulation, and application for exception from the regulation may be made to the administrator.

The plan was agreed upon after considering other steps, including a nation-wide system of priorities for coal, which is still under study.

FPC Cuts PUD Contract on Housing Rate by $41,800

"Cheapest power" directive employed to effect reduction in contract for electric service to Vancouver housing project between Clark County PUD and Federal Public Housing Authority

Applying the terms of the President's October 22 "cheapest power" directive to the contract between the Clark County (Wash.) Public Utility District and the Federal Public Housing Authority for its Vancouver project, the Federal Power Commission has wrung approximately $41,800 from the annual return exacted by the PUD under its "franchise" as sole power distributor in that section of the county.

The contract was renegotiated at FPHA insistence last spring after Rep. J. William Ditter, Pennsylvania Republican, complained in Congress that the PUD "sits between two other federal agencies and collects $50,000 a year for rendering absolutely no service" (ELECTRICAL WORLD, April 17, 1943, page 81).

The PUD, having purchased from FPHA about 26,800 feet of transmission lines running from the Bonneville Power Authority substation to the project sites, will now:

1. Sell power to FPHA at the same rate it buys the power from Bonneville.
2. Collect a 6 percent yearly return on the cost of the line, which was approximately $39,500.
3. Collect approximately $4,000 a year amortization charges.
4. Collect approximately $1,530 yearly for operation and maintenance expenses and insurance on the facilities.
5. Collect approximately $3,830 yearly for the allocated portions of the general and administrative expenses.
6. Collect approximately 5 percent a year of the cost of facilities for taxes.

FPHA would offer no estimate of the amount it would have to pay each month over and above its energy payments at the Bonneville F-2 rate, but the sum would appear to be in the neighborhood of $1,100 monthly.

Amortization Provided

The revised contract provides that the cost of the facilities purchased by Clark County be amortized on a 6 percent sinking fund basis, with the facilities used to serve permanent parts of the project amortized over 25 years

COMMONWEALTH'S 2,000th—The 2,000th employee of Commonwealth Edison Co. to join the armed forces, Dorothea E. Tolp, 1107 North Kedvale Avenue, is sworn in as a private in the Marine Corps Women's Reserve by Capt. Arthur J. Murphy. Looking on is Sergeant Gladys O'Reilly, who graduated from Austin high school with Dorothea in 1939. Miss Tolp hopes to become a candidate for the Marine Corps Women's Reserve band after rounding out her "boot" training. She is the 26th Edison girl to enlist.

and those used for temporary parts of the project amortized over five years. The contract provides also that amortization payments for the facilities used to serve temporary parts of the project shall stop short of the five-year period if the temporary parts of the project are liquidated before then.

Approximately $7,000 of the facilities cost was charged to permanent installations, and in excess of $31,000 was charged to temporary installations for amortization purposes. Approximately $9,000 net of the charges against temporary installations is estimated to be salvageable.

The contract between the PUD and the project for repair and maintenance service on FPHA facilities remained unchanged. The $41,800 reduction was based on an estimated 90 percent occupancy rate.

The Bonneville F-2 rate entails a demand charge of 75 cents per kw. and an energy charge of 2½ mills per kw.-hr., with a reduction of ½ mill per kw.-hr. on all power with a load factor higher than 50 percent. FPHA estimates that the project, when completed late this year, will have a demand between 10,000 and 12,000 kw. with a 45-55 percent load factor.

The project, with a top capacity in the neighborhood of 40,000 persons in about 17,000 dwelling units, including dormitory rooms, will serve the Kaiser shipyards in Vancouver, Swan Island and Richmond, Wash. More than 90 percent of the project is temporary.

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Type RW Insulation Labels Suspended

Type RW insulation for building wire will not carry the Underwriters' Laboratories label after the end of August, a recent announcement from that organization said. Insulating compounds for all listed makes of type RW wire have contained large proportions of new natural rubber, the use of which will not be allowed beginning September 1, the announcement said, due to WPB restrictions on natural rubber.

WPB's order R-1 (ELECTRICAL WORLD, July 17, page 18) presaged an early substitution of synthetic for crude rubber in the insulation and jacketing of wire and cable. Investigations of the properties and performances of compounds made with available rubber substitutes have been scheduled by Underwriters, with active industry co-operation, but no results have been announced to date.

Type RW insulation is recognized in the 1940 edition of the National Electrical Code. The table with Section 3005 describes it as "moisture resistant" and suitable for general use or in wet locations where lead-covered conductors are otherwise required. Lead is not a critical material, the announcement points out, and return to the use of lead-covered cables where wires must be employed underground, in contact with earth, or in wet locations, seems to be called for until acceptable properties and performances of new insulating compounds are established.

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FPC Authorizes Pennsylvania Merger

The Federal Power Commission last week authorized the Pennsylvania Electric Co. to acquire all the utility assets and facilities of the Keystone Public Service Co., Bradford Electric Co. and Erie County Electric Co., all in western Pennsylvania, and to merge the facilities of these companies with those of Pennsylvania Electric. Similar authorization had already been granted by the Securities and Exchange Commission.

Appliance Care Drive Scheduled

At Chicago on Aug. 24 representatives of manufacturers of home appliances met to discuss with M. R. Rodger, chairman of the Edison Electric Institute appliance conservation committee, the coming national program on appliance care and maintenance.

The program, scheduled to start January, 1944, will be backed by national and trade advertising of electrical manufacturers. Local utility advertising and demonstrations will tie in with the national theme "Better Care—Less Repair." Window and store displays for 25,000 dealers will be made available, and a "check list" on care of home appliances will be distributed to homes by local electrical interests.

Education of all electric industry employees is planned to furnish a nucleus of informed personnel who will know how to conserve appliances and make them last as long as possible—as an aid to the war effort on the home front.

Details will be announced in New York and Chicago meetings.

MEETINGS

Previously Listed

American Institute of Electrical Engineers—National technical meeting, Hotel Utah, Salt Lake City, Utah, September 2-4; H. H. Henline, national secretary, 33 W. 39th St., New York N. Y.

International Association of Electrical Inspectors—Western section, LaSalle Hotel, Chicago, Ill., September 13-15; F. H. Moore, secretary, 320 N. Meridian St., Indianapolis, Ind. Eastern section, New York, N. Y., week of September 20; F. N. M. Squires, secretary, 85 John St., New York, N. Y. Southern section, Roosevelt Hotel, New Orleans, La., September 27-29; C. M. Jones, secretary, 307 Trust Co. of Georgia Bldg., Atlanta, Ga.

National Association of Railroad and Utilities Commissioners — War conference, Edgewater Beach Hotel, Chicago, Ill., September 14-16. Ben Smart, secretary, 7411-13 New Post Office Bldg., Washington, D. C.

Municipal Electric Utilities Association of New York State—Annual conference, Lake Placid Club, Lake Placid, N. Y., September 15-17. T. J. McKee, secretary, 200-212 East Third St., Jamestown, N. Y.

International Association of Electrical Leagues—Annual conference, Netherland Plaza Hotel, Cincinnati, Ohio, September 16-17. O. C. Small, secretary, 155 East 44th Street, New York, N. Y.

Pennsylvania Electric Association — Annual meeting and business conference, Wm. Penn Hotel, Pittsburgh, Pa., September 23; A. B. Millar, managing director, State Street Bldg., Harrisburg, Pa. Electrical equipment committee, Benjamin Franklin Hotel, Philadelphia, Pa., October 14-15; A. N. Shealy, chairman, Pennsylvania Water & Power Co., Lexington Bldg., Baltimore, Md.

Southeastern Electric Exchange—Engineering and operation section, Tutwiler Hotel, Birmingham, Ala., September 23-24. J. W. Talley, executive secretary, 303 Haas-Howell Bldg., Atlanta, 3, Ga.

American Society of Agricultural Engineers — North Atlantic section, Hotel Belmont Plaza, New York, N. Y., September 27-28. R. J. Bugbee, secretary, 121 West St., Rutland, Vt.

International Municipal Signal Association—War conference, Hotel Statler, Cleveland, Ohio, September 27-29. Irvin Schulsinger, secretary, 8 East 41st St., New York, N. Y.

Association of Iron and Steel Engineers—Annual meeting, Wm. Penn Hotel, Pittsburgh, Pa., September 28-30. Brant Wiley, managing director, Empire Bldg., Pittsburgh, Pa.

American Society of Mechanical Engineers—Joint meeting with Engineering Institute of Canada, Royal York Hotel, Toronto, Ont., Canada, September 30-October 2. Annual meeting, Pennsylvania Hotel, New York, N. Y., November 29-December 3. Ernest Hartford, executive assistant secretary, 29 West 39th St., New York, N. Y.

National Safety Council — Congress and exposition, Sherman Hotel, Chicago, Ill., October 5-7. N. H. Dearborn, managing director, 20 N. Wacker Drive, Chicago, Ill.

Edison Electric Institute — Accident prevention committee, LaSalle Hotel, Chicago, Ill., October 8-9; prime movers, electrical equipment and transmission and distribution committees, Hotel Cleveland, Cleveland, Ohio, October 11-12. Col. H. S. Bennion, managing director, 420 Lexington Ave., New York, N. Y.

National Electrical Contractors Association — Drake Hotel, Chicago, Ill., October 10-11. L. W. Davis, general manager, 633 Investment Bldg., 15th and K Sts., N. W., Washington, D. C.

Electrochemical Society — Fall meeting, Pennsylvania Hotel, New York, N. Y., October 13-16. Colin G. Fink, secretary, Columbia University, 3000 Broadway, New York, N. Y.

American Welding Society — Annual meeting, Hotel Morrison, Chicago, Ill., week of October 18. Miss M. M. Kelly, secretary, 29 West 39th St., New York, N. Y.

Engineers Council for Professional Development—Annual meeting, Engineering Societies Building, New York, N. Y., October 23. A. B. Parsons, secretary, 29 West 39th St., New York, N. Y.

National Electrical Manufacturers Association—Annual meeting, Waldorf Astoria Hotel, New York, N. Y., October 25-29. W. J. Donald, managing director, 155 E. 44th St., New York, N. Y.

Joint Fuels Conference — American Institute of Mining Engineers and American Society of Mechanical Engineers—Wm. Penn Hotel, Pittsburg, Pa., October 28-29. T. E. Purcell, chairman, Duquesne Light Company, 435 Sixth Ave., Pittsburgh, Pa.

Week's Output Again Goes Up

Following the slight recession in the output curve for the week ended August 21, the figures for the week of August 28 brought the curve up sharply again to a new high record. The amount of electrical energy distributed by the light and power industry for the week ended August 28 totaled 4,322,195,000 kw.-hr., compared to 4,264,824,000 kw.-hr. the week previously and 3,639,961,000 kw.-hr. during the corresponding week in 1942. The latest week's figures represent a rise of 18.7 percent over last year.

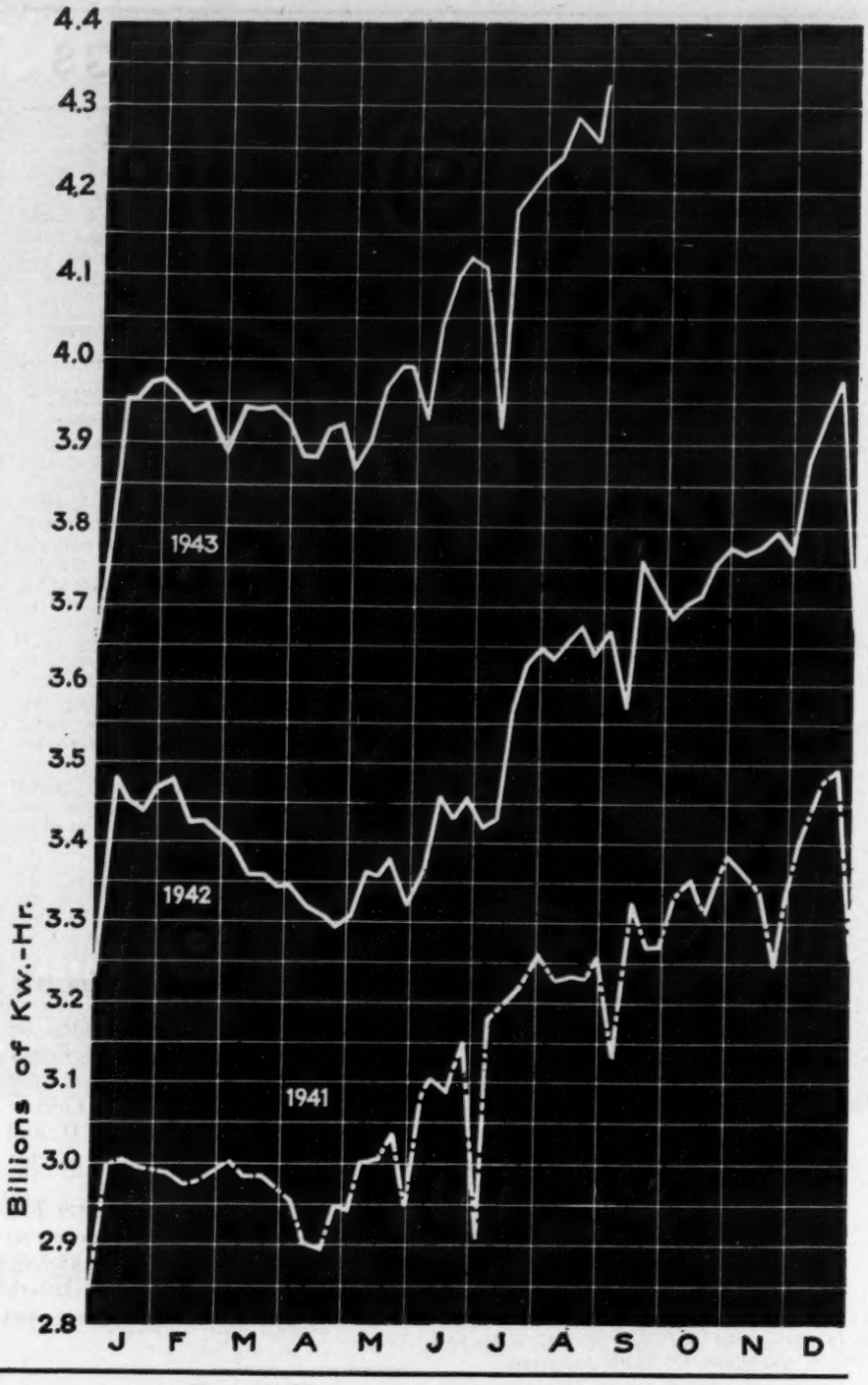
Five of the seven major geographic regions of the country contributed to the week's output rise; only the West Central and Rocky Mountain sections fell off from the gains registered during the previous week. The Southern States led the country by a fractional margin over the Pacific Coast area in percentage increases over the 1942 week. The Pacific Coast, with a 22.9 percent increase, made the biggest gain of any section over the gains reported the previous week. The Southern States, with a 23.0 percent gain, however, nosed them out for first place.

Weekly Output, Million Kw.-Hr.

1943		1942		1941	
Aug. 28	4,322	Aug. 29	3,640	Aug. 30	3,261
Aug. 21	4,265	Aug. 22	3,674	Aug. 23	3,231
Aug. 14	4,288	Aug. 15	3,655	Aug. 16	3,238
Aug. 7	4,240	Aug. 8	3,637	Aug. 9	3,233
July 31	4,227	Aug. 1	3,649	Aug. 2	3,263
July 24	4,196	July 25	3,625	July 26	3,220
July 17	4,184	July 18	3,565	July 19	3,199
July 10	3,919	July 11	3,429	July 12	3,178
July 3	4,110	July 4	3,424	July 5	2,901
June 26	4,120	June 27	3,457	June 28	3,157

Percent Change from Previous Year

	Week Ending		
	Aug. 28	Aug. 21	Aug. 14
New England	+7.1	+5.1	+5.8
Mid-Atlantic	+19.9	+15.9	+18.1
Central Industrial	+16.4	+14.0	+16.3
West Central	+13.0	+14.5	+17.1
Southern States	+23.0	+20.5	+19.1
Rocky Mountain	+17.6	+17.7	+20.5
Pacific Coast	+22.9	+18.5	+19.1
Total United States	+18.7	+16.1	+17.3



FPC Holds Wisconsin River is Navigable

Declaring the Wisconsin River to be navigable water of the United States from its source in Wisconsin and Michigan to its junction with the Mississippi near Prairie du Chien, Wisconsin, the Federal Power Commission last week ordered the Wisconsin Public Service Corp. to file, before October 1, an application for license for the operation and maintenance of the reconstructed Tomahawk hydro-electric project on the Wisconsin River.

The company contended that the authority it acquired under the Wisconsin laws of 1887 authorizing the Tomahawk project constitutes a permit or valid existing right-of way granted prior to passage of the Federal Power Act of 1920 and that, having such state authority, no federal authority is necessary. The commission overruled this contention and pointed to a decision of the U. S. Circuit Court of Appeals for the District of Columbia affirming FPC's order requiring Pennsylvania Water & Power Co. to apply for a license for the Holtwood project on the Susquehanna River, which the Supreme Court upheld.

July Energy Production Hits All-Time High

Electric energy produced for public use in July totaled 18,417,091,000 kw.-hr., the highest monthly production on record, representing an increase of 16.8 percent over production in July, 1942, the Federal Power Commission has announced.

Average daily production of electric energy for public use in July was 635,072,000 kw.-hr., also a new high level, but only a slight increase over average daily production during the previous month.

SEC DECISIONS - HEARINGS

The Securities and Exchange Commission, in a series of orders and opinions issued last week affecting utility companies:

APPROVED A PROPOSAL of National Power & Light Co. to sell to the Memphis Generating Co., a subsidiary, 3,500 shares of Memphis' stock at par $100 per share, or a total of $350,000. National owns 50,500 shares of Memphis stock—all the outstanding capital stock of the company. Proceeds of the sale, which is a step in compliance with a commission dissolution order, dated August 23, 1941, will be used, together with other funds, to retire the remainder of 12,000 shares of National's outstanding $6 preferred stock at $100 per share, or a total of $1,200,000.

AUTHORIZED West Texas Utilities Co., a subsidiary of Middle West Corp., to issue $18,000,000 of 3¼ percent first mortgage bonds, series A, due 1973, for the purpose of redeeming a similar amount of 3¾ percent first mortgage bonds, due 1969.

APPROVED THE SALE of all the outstanding capital stock, comprising 2,500 shares of no-par common stock, of Western States Utilities Co., subsidiary of Peoples Light & Power Co., to Gerald L. Schlessman of Denver, for $142,500 in cash. The transaction was described as part of Peoples voluntary plan to effect compliance with "death sentence" provisions of the Holding Company Act.

APPROVED THE SALE by Consolidated Electric & Gas Co. of all the 7,890 outstanding shares of capital stock of its subsidiary, the Lynchburg (Va.) Gas Co., to Scott, Warner & Mason, investment bankers of that city, for $347,000 cash.

EXTENDED TO August 31, 1944, an exemption previously granted to General Electric Securities Corp. and G. E. Employees Securities Corp. from those provisions of the Holding Company Act which would require them to register as a holding company by virtue of their holdings of securities of New England Public Service Co.

APPROVED PAYMENT by the North American Co. of a quarterly dividend on its common stock in the common capital stock of its subsidiary, Pacific Gas & Electric Co. The dividend, payable October 1, will be at the rate of one share of P.G. & E. for each 100 shares of North American.

GRANTED Eastern Kansas Utilities, Inc., an extension of one year, to July 16, 1944, within which to comply with a commission order directing the company to dispose of its ice and cold storage business.

Applications Filed

In addition, the SEC last week announced the receipt of the following applications:

PROPOSAL OF Milwaukee Electric Railway & Transport Co. to redeem on October 1, at par plus accrued interest, $500,000 face amount of its first mortgage 4 percent bonds, and purchase for retirement 4,000 shares of its capital stock, par $100, from Wisconsin Electric Power Co., the parent.

PROPOSAL OF Commonwealth & Southern Corp. to pay a dividend of 75 cents a share, or an aggregate of $1,111,500, on shares of its outstanding preferred stock. The dividend was declared on Aug. 24.

PROPOSAL OF Standard Power & Light Corp. to sell $35,000 of miscellaneous bond holdings, chiefly railroad securities, and invest the proceeds in U. S. obligations.

Hearings Scheduled

Hearings on proposals, scheduled by the commission, included the following:

SEPTEMBER 7: Hearing on application of General Gas & Electric Corp. to pay out of capital or unearned surplus a quarterly dividend on its $5 prior preferred stock for the quarterly period ended Sept. 15, 1942. Amount of the dividend on the 60,000 outstanding shares of this stock will be $75,000 of which approximately $40,125 will be paid to public holders of 32,111 shares.

SEPTEMBER 9: Hearing on application of the Commonwealth & Southern Corp. for permission to reacquire and retire 32,627 shares of its presently outstanding preferred stock. The request was in the nature of an amendment to the company's recently submitted recapitalization plan and the company declared that it had $2,500,000 not required for any other corporate purpose but the purchase and retirement of its preferred stock.

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Otter Tail Files to Buy Central Electric

Otter Tail Power Co. has filed an application with the Federal Power Commission for authorization to acquire certain facilities of the Central Electric & Telephone Co., Sioux Falls, S. D., and to borrow sums from banks to pay the costs of acquiring the facilities.

The application states that Otter Tail and Central have entered into a contract whereby Otter Tail agrees to purchase from Central Electric all of the latter's electric properties in North Dakota, and also its gas manufacturing and distributing system in Jamestown, N. D., for $400,000.

The communities served by Central Electric in North Dakota are already physically integrated with the Otter Tail system, the application pointed out, and energy consumed by these communities is generated by Otter Tail.

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Boston Edison Co.'s Pay Increase Approved

Three thousand employees of the Boston Edison Co. have become eligible for potential pay increases ranging from 4 to 7.5 cents per hour, following an announcement by the New England War Labor Board office of approval of a wage agreement between the utility and the United Brotherhood of Edison Workers. It is estimated that the increase will augment the annual payroll by about $300,000.

In announcing approval of the increase, Saul Wallen, WLB chairman for New England, stated that the agreement provides for raising maximum pay scales by $1.50 to $3 per week, but does not necessarily mean increases at once for all Boston Edison employees. "He pointed out that the increase establishes the ultimate pay which employees might receive provided they remain with the company long enough to receive top rates. The agreement provides for a $1.50 increase on schedules with a top of $27 or less per week as of January 1, 1941; $2.50 between $29 and $4[illegible] per week as of that date, and $3 on schedules in excess of $48. The agreement is retroactive to January 3, 194[illegible]

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Kentucky Dam Generator Gets AA-3 Rating

OWU has assigned an AA-3 Priority rating to a 32,000-kw. generator to be installed in the Kentucky Dam of the Tennessee Valley Authority as part of the 1945 power program (ELECTRICAL WORLD, July 24, 1943, page 65). The unit is needed to relieve shortages in the TVA area.

The unit is the third of its size scheduled for Kentucky Dam. Two others are due in operation by the end of this winter. The third unit was downrated last November, but restored to the program because the need exists in the area for 100 percent load factor power from at least one more machine and, much of the time, from two machines. Capacity of the third unit will be handled on lines under construction for the first two units.

Utility Reports

	Net Income 1943	1942
*Arkansas Power & Light	$1,353,795	$1,972,000
†California-Oregon Power	1,268,841	1,044,068
†Cincinnati Gas & Electric	4,178,216	2,331,716
*Commonwealth & Southern and subs.	13,830,356	10,945,235
*Connecticut Light & Power	3,738,041	3,656,859
*Consumers Power	7,980,139	8,384,441
†Dayton Power & Light	2,329,945	1,846,295
*Detroit Edison and subs.	8,669,735	9,590,631
†Duquesne Light	11,044,455	10,508,637
*Houston Lighting & Power	3,251,997	2,452,267
†Louisville Gas & Electric and subs.	2,714,722	2,798,327
*Ohio Edison	3,378,606	3,408,982
*Sierra Pacific Power	596,638	579,103
*Tampa Electric	1,196,578	1,143,125
†Virginia Public Service and subs.	985,723	816,618

*Twelve months ended July 31.
†Twelve months ended June 30.

Introducing

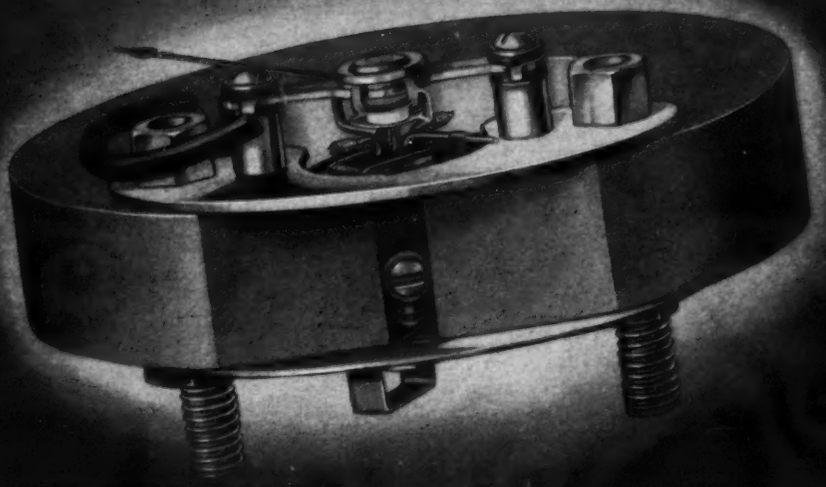
INTERNAL-PIVOT ELECTRIC INSTRUMENTS

Voltmeter in a metal case, typical of DW-51 and DW-52 instruments. Also available in molded Textolite case

TYPE DW-51 D-c Voltmeters, Ammeters, Milliammeters, and Microammeters

TYPE DW-52 Radio-frequency Ammeters and Milliammeters (A-c Thermocouple Types)

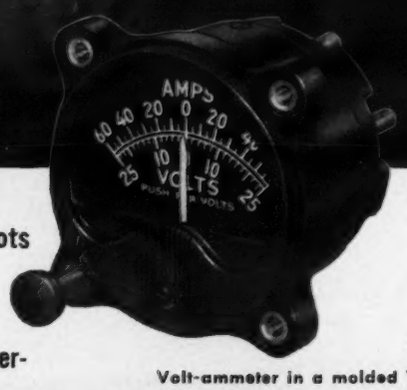
TYPE DW-53 D-c Voltmeters, Volt-ammeters, and Ammeters for Naval Aircraft



ELEMENT ASSEMBLY

(Approx twice actual size)

Note the clean, simple lines of this compact element, made possible by the internal-pivot construction and by securing all parts solidly to the cast-comol magnet.



Volt-ammeter in a molded Textolite A-N case, typical of DW-53 instruments for aircraft

for **THINNESS** obtained by the use of internal pivots—pivots mounted on the inside of the armature instead of the outside

with **HIGH FACTOR OF MERIT**—resulting from a feather-weight moving element and relatively high torque

THESE new instruments are especially well suited for use in radio, other communications equipment, and naval aircraft—wherever d-c or r-f measurements are desired. In most ratings, they are approximately one inch deep.

Thinness is obtained by the internal-pivot construction. But this design affords much more than thinness.

The elements, on account of their high torque and large-radius pivots, are well able to withstand vibration. High torque combined with a lightweight moving element results in fast response. Good damping makes for ease and accuracy of reading. Large clearances help to insure reliable operation.

All these features add up to a high factor of merit and all-around fine performance.

For complete information on ratings, prices, dimensions, and specifications, ask the nearest G-E office for Bulletins GEA-4064 and 4117, or write to General Electric, Schenectady, N. Y.

GENERAL ELECTRIC

602-49-6900

HOW DESIGN... CONSTRUCT OPERATE MAINTAIN

33-Kv. Mobile Sub Backed by 4-Kv. Unit

By HOLLIE M. WADE
Distribution Engineer, Electric Operating Department, Indianapolis Power & Light Company, Indianapolis, Ind.

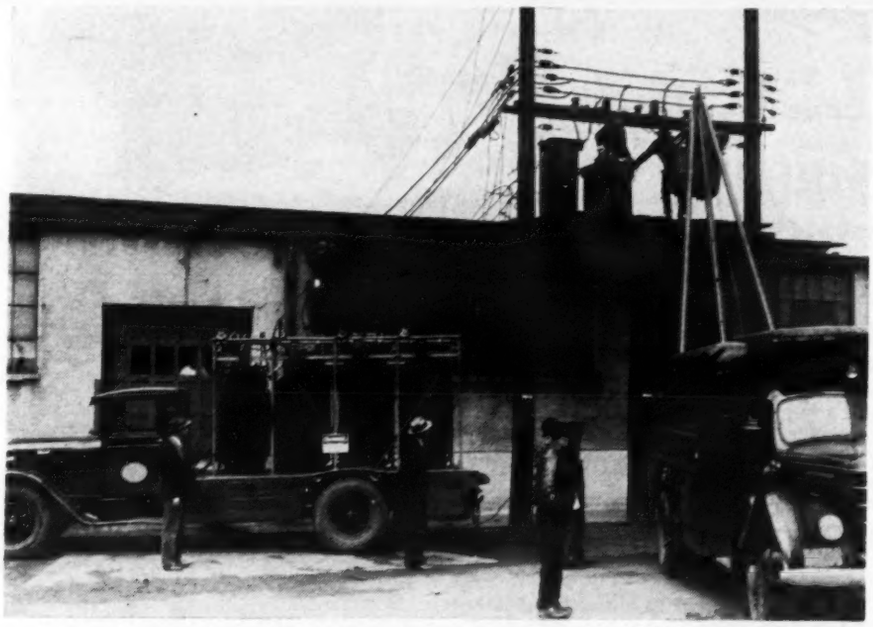
Since the purchase of a 33-kv., 2,500-kva. mobile substation by Indianapolis Power & Light Company in March, 1941, for emergency or maintenance handling of 33,000-volt distribution substation loads a 4-kv. portable bank has been added as a companion unit for serving the many Indianapolis war industries that are supplied from the overhead 4-kv. distribution system.

The portable 4-kv. bank was built at the Morris Street operating center of the company, mainly from old equipment. It consists of three 100-kva. and one 75-kva. transformers and a substation structure built from salvaged pipe, all mounted on a 1930 model 3½-ton Stewart truck, a completely overhauled line truck. The three 100-kva., 2,400/240-480-volt transformers are wye-connected on the high side, delta on the low side. The 100-kva. transformers have two plus 2½ percent and two minus 2½ percent full-capacity taps with external tap-changer handle. The 75-kva. unit is a 2,400/120-240-volt standard conventional transformer.

Only new equipment used are the transformers. These have the four secondary leads brought through the case to a terminal board on the pipe structure and arranged so that it is only necessary to switch copper straps to obtain either 240- or 480-volt secondary. It is not necessary to change the position of the three-phase service leads from the terminal board. The secondary of the 75-kva. unit is connected to a separate three-wire service.

Red clearance lights for night parking were installed on the truck. To prevent an extra burden on the truck battery 220-volt service has been taken from both the power bank and lighting transformer to a two-pole, double-throw switch, thence to a 220/6-volt transformer for the lights.

In the first four months of operation the portable bank was used at thirty locations without an interruption of service. It has permitted the line department to make transformer or structure replacements without removing the bank from service while repairs were in progress.



MOBILE 4-kv. substation serves war industry while bank of three 75-kva. transformers is replaced by three 100-kva. units; mobile unit supplements 33-kv. mobile substation on system; author stands at left

Transformer Hangers Identified

There are almost as many different distribution transformer hangers as there are makes, types and sizes of transformers. Recent years have seen much progress in standardization in this direction, but standardization of modern designs incorporated in new transformers does little to resolve the confusion among the many thousands of older transformers now in service and likely to remain in service for a long time to come. And in handling these older transformers in and out of stock, cleaning them up and repairing them, hangers and transformers can easily get separated. Then when a transformer is to be taken out and installed it sometimes takes quite a lot of pawing around to find the proper hanger for it. This does

The Transformer THAT MADE THE Load-center Unit Substation Possible

THE inherent safety of Pyranol* transformers led to the development of the modern load-center system of power distribution. It made possible the basic element of such a system, the load-center unit substation.

In turn, these easy-to-order, easy-to-install unit substations enable war plants to get rolling months sooner than would be possible otherwise. And because Pyranol transformers permit installation in or near the working areas, the elimination of long secondaries is saving thousands of tons of copper. Power losses are reduced, and voltage regulation is improved.

Remember, too, that Pyranol transformers are *all-purpose* units. Whether or not unit substations are called for, Pyranol permits installation anywhere you wish, indoors or outdoors, above ground or underground, in places wet or dry, clean or dusty. Whatever location you choose, these transformers will simplify your installation problem, and will supply the power for your war loads with little or no maintenance. Write for Bulletin GES-2974. *General Electric, Schenectady, N. Y.*

*Reg. U.S. Pat. Off.

- - - the All-purpose PYRANOL TRANSFORMER for Safety and Savings

Three unit substations at load centers in a new war plant using Pyranol transformers for safety. Note that no vaults are required. Secondaries are short and they enter top of switch gear to save tons of copper.

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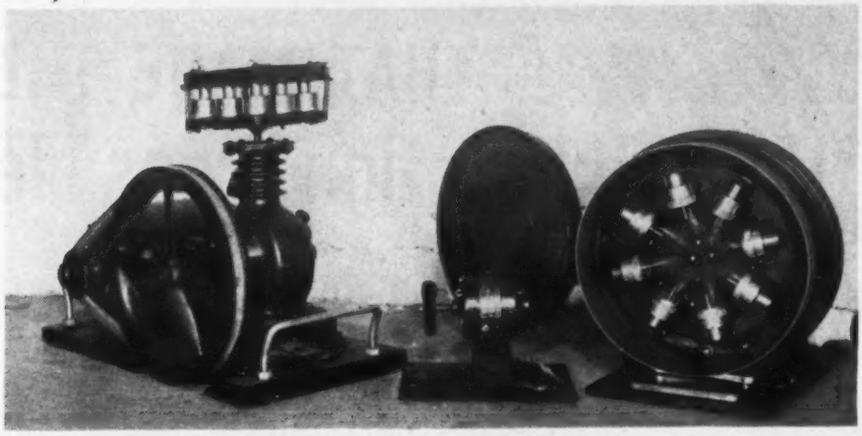
402-60-5100



TELECHRON rotor-cleaning equipment—agitator (left), buffer (center), centrifuge (right)

not happen in one of the division stockrooms of the Virginia Public Service Company.

When a distribution transformer is brought into this stockroom from the line its hanger is given a serial number, which is stenciled on the hanger and on the top of the transformer. When the transformer is to go out into service again its personal and particular hanger is quickly identified without any guessing or trying out to get one to fit.

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How to Service Telechron Rotors

By GEORGE W. VILLERS,
Meter Foreman, Iowa Electric Light & Power Company, Cedar Rapids, Iowa

By the aid of three inexpensive machines—*viz.*, an agitator, a buffer, and a centrifuge—considerable time has been saved in servicing telechron motors used on time switches for off-peak water heating, as well as demand meters, recording meters and other instruments. The machines were built by and are being used in the meter department of the Iowa Electric Light & Power Company.

The centrifuge was built for the purpose of quickly removing (1) old oil and sludge, (2) cleansing solution and (3) cleansing oil. Agitator is for washing and cleansing the inside of the cartridge with the cleansing solution and oil. Buffer is to remove the hardened oil on the rotor shaft.

By the old method draining of the rotors required from 15 to 30 minutes, whereas with the centrifuge from one to one and a half minutes will suffice. Rotors were rinsed manually with cleansing solution and oil, one at a time. With the agitator eight rotors can be cleaned at one time with very little effort.

Housing for the centrifuge was made from a General Electric type G-8 recording demand meter case. It is bolted to a 7x8x$\frac{3}{8}$-in. steel plate welded vertically to the base, a 12$\frac{3}{4}$x 8x$\frac{3}{8}$-in. steel plate. On the base is also mounted a 1/6-hp., 1,725-r.p.m. motor at rear of the housing and slightly raised by an angle-iron frame so that the motor shaft protrudes through holes in the vertical plate and center of the G-8 case.

To the motor shaft a 7$\frac{3}{4}$-in. diameter by $\frac{1}{8}$-in. thick steel plate or disk is coupled, inside the case. Spaced equally around the disk, $\frac{1}{2}$ in. from the periphery, eight 60-amp. fuse clips were fastened. Directly in line with the fuse clips and 1$\frac{1}{2}$ in. from the edge eight $\frac{1}{4}$-in. wide light metal straps were fastened, the strap opening being just large enough for the large part of the rotor barrel to slip into and fit snugly. The 60-amp. fuse clip holds the small barrel of the rotor in place. Thus the rotors can be quickly and easily slipped into place or removed and are held firmly during the operations. Two or three $\frac{1}{4}$-in. holes in the case bottom are provided for drainage.

The agitator was made up of a 1/6-hp., 1,725-r.p.m. motor with a 1$\frac{1}{2}$-in. pulley and an old refrigerator compressor with a 10-in. pulley, both mounted on an 18x9$\frac{1}{2}$x1-in. wood base, with $\frac{3}{8}$-in. steel rod handles at each end. The compressor head was removed and top of the piston drilled and tapped. A $\frac{5}{16}$-in. steel rod was screwed into the piston, the rod being just long enough so that a 2x2x $\frac{1}{16}$-in. light steel plate, welded to upper end of the rod, will just clear the piston opening on the down stroke.

To the metal plate a 4$\frac{1}{2}$x5$\frac{1}{4}$x$\frac{1}{2}$-in. board was bolted. In the board eight holes are drilled large enough to accommodate the shaft of the rotor and countersunk to allow the shoulder around the shaft bearing to fit in the hole.

Another 4$\frac{1}{2}$x5$\frac{1}{4}$x$\frac{1}{2}$-in. board was covered on one side with a piece of inner tubing. This gasket is to retain the liquids in the rotor during the agitating process. On two corners between the top and bottom boards, on the same side, two coil springs are fastened. Two more coil springs similarly placed at the other two corners are fastened permanently to the bottom board and with hook and loop to the top board. This arrangement allows the top board to be lifted for insertion and removal of the rotors.

Buffer

The buffer is a 1/20-hp. motor mounted on a 6$\frac{1}{4}$x8x$\frac{3}{16}$-in. steel plate. The buffing wheel of very fine wire, a type used by jewelers, is 2$\frac{1}{2}$ in. in diameter and $\frac{3}{8}$ in. wide and is mounted on the motor shaft. The fine wire buffer does not injure the rotor shaft when hardened oil is being removed.

A routine for cleaning telechron rotors can be set up whereby eight rotors may be placed in the centrifuge and run through. Then another group of eight rotors may be placed in the machine. In the meantime cleansing fluid can be put in the previous group and they can be put in the agitator. In this manner the two machines can be kept busy constantly.

•

To Show That Pumps are Pumping

By E. R. BONDS
Robert & Company, Inc., Atlanta, Ga.

More than the bare indication that motor switches are open or closed is desirable at the point where distant water pumps are controlled. The switch may be closed, the motor be running, but the centrifugal pump may be just churning idly because a valve has failed to operate as it should. Yet, if no more supervision is provided than simply an indica-

Here's the ballast that helps save CRITICAL MATERIAL

Saves pounds per fluorescent fixture

NO ENCLOSURE REQUIRED. Because this new ballast with leads out the bottom can be mounted completely exposed, it requires only a shallow, narrow wiring channel — thus large quantities of steel, formerly required to house the complete ballast in the fixture itself, can be saved.

LONG BALLAST LIFE. And because of its exposed location, it will operate in lower ambient temperatures—which contributes to long ballast life. It does not require special installation features, such as ventilating louvers and conduction plates.

SAME HIGH QUALITY. This ballast differs from ballasts of the conventional design only in location of the leads, which come out through two bushed holes in the base plate—one at each end.

WIDE RANGE OF RATINGS. Ballasts with leads out the bottom are available in 40-watt Tulamp and three-lamp and 100-watt Tulamp and Forlamp ratings—those most popular for war-plant installations.

FOR MORE INFORMATION about this improved design, and for details on other G-E ballasts for fluorescent lighting, send for newly revised catalog GEA-3293. *General Electric Company, Schenectady, New York.*

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BALLASTS FOR FLUORESCENT LIGHTING

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The best investment in the world is in this country's future—

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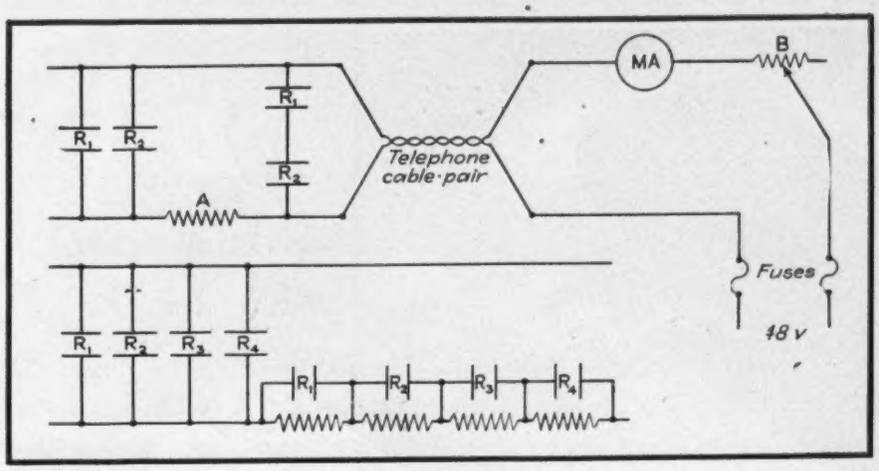
Hear the General Electric radio programs: The "Hour of Charm" Sunday 10 p.m. EWT, NBC "The World Today" news, every weekday 6:45 p.m. EWT, CBS



SUPERVISORY CIRCUIT to indicate pump operation

tion that the motor switch is closed, the operator at the control point does not know that the pump is not working.

A simple scheme used by Robert & Company in several installations of remote pumping units is shown in the accompanying diagram. It not only supplements the indications of motor switch positions, but may replace them if desired. And although the scheme as illustrated covers the operation of only two pumps, it may be expanded to include more by addition of resistors and revision of connections as shown.

Each motor circuit at the pumping station includes a double-contact CO relay. The relay is set to close at 60 percent of motor current. The relay may include time delay to prevent closure and momentary indication at the control point during motor starting, but this is not necessary. If, for any reason, the pump fails to push out water the relay does not close and no indication is received. If all goes well the relay closes contacts R_1 in the diagram and the current from the 48-volt control circuit flows through the resistor A and makes a half-scale reading on the milliameter at the control point. Then when the second pump goes into operation contacts R_2 close and the milliameter reads full scale. The variable resistance B is used to calibrate the meter for half- and full-scale readings.

Supervision of two pumps requires only one fixed resistor in the circuit, but for more than two there must be a fixed resistor for each pump and the shorting-out contacts are disposed a little differently, as shown in the supplementary diagram. Also the milliammeter readings, instead of being half- and full-scale, are in a series of steps corresponding to the number of pumps.

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How to Close, Trip Circuit Breakers

3. Trip-Free Mechanism*

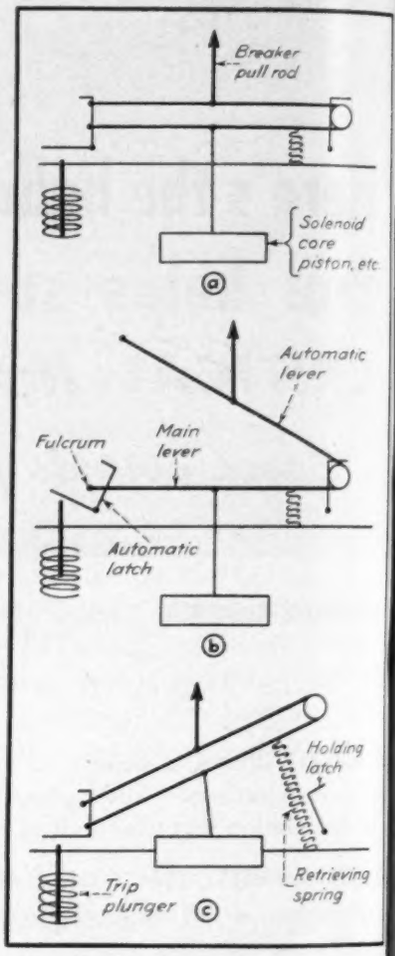
By G. J. EASLEY

Switchgear Engineer, Westinghouse Electrical & Manufacturing Company, East Pittsburgh, Pa.

A mechanically trip-free mechanism which applies to solenoid units and other types as well is shown at right. In its simplest form it consists of two levers. One (automatic lever) is connected to the breaker and the other (main lever) to the source of pull such as solenoid, motor, piston, etc. The two levers are hinged together at the right end and the automatic lever is pinned to the mechanism frame at the left end. When the breaker trips, starting from position (a), the tripping latch releases the automatic lever to the trip-free position (b). The automatic lever releases the holding latch on its way open, thereby allowing the retrieving spring to push the main lever open; thus it latches (at automatic latch) to the automatic lever in the open position as shown in position (c). The mechanism closes from position (c). In case the breaker closes on a fault the device is free to trip from the left end (position b); the breaker opens quickly without any drag due to the source of pull.

The non-mechanically trip-free arrangement is well adapted for high-speed reclosing service. The closing coil may be energized shortly after the trip coil is energized; thus, by the time the breaker is only part way open the closing-coil current has built up sufficiently to arrest the opening motion and return the breaker to closed position.

It has been estimated that approximately 80 percent of the faults on power systems are of a temporary nature; if they are interrupted and the fault path allowed to deionize they will not be re-established when the breaker is closed again. If reclosure is sufficiently rapid, synchronous machines will not drop out of step and system stability will be maintained. Usually reclosing speeds are from 30 to 60 cycles based on 60-cycle frequency, but some systems require as low as 20-cycle reclosing for maintenance of stability. A further refinement in this direction has been developed involving the use of single-pole reclosing; using one mechanism per pole, only the faulted phase is interrupted.



SCHEMATIC DRAWINGS of mechanically trip-free mechanism used on circuit breakers; (a) mechanism closed, (b) mechanism tripped free, (c) mechanism open

*Third of a series of twelve articles which began in August 7, 1943, issue of "Electrical World."

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GENERAL ELECTRIC

HOW TO CUT OUT ONE TRANSFORMER IN A "Y" BANK

A. L. WILLIAMS, Assistant Overhead Engineer, Bureau of Power and Light, City of Los Angeles

Methods of changing connections to operate as open wye in case of burn-out of one transformer have been established as an electrical standard for the bureau. Assume the middle transformer to be burned out. Open fuse and make cuts as shown in the diagram. Dotted lines indicate connections to be made. Cuts are to be made in every case before connections are made. This same method is used to cut out either of the other two transformers.

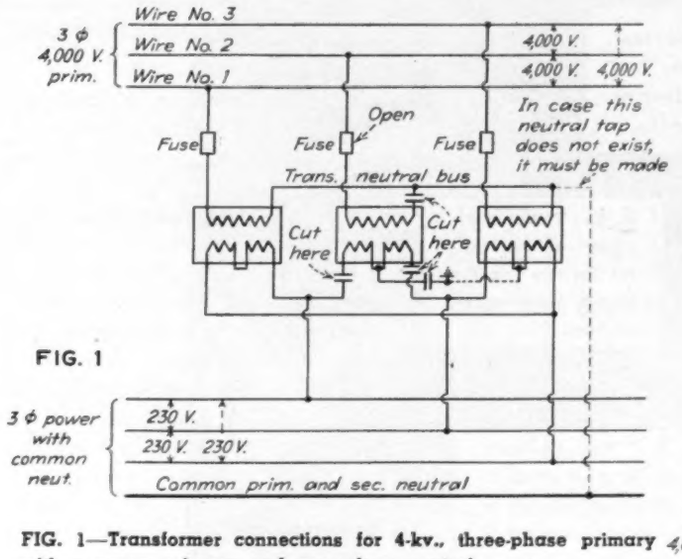


FIG. 1

FIG. 1—Transformer connections for 4-kv., three-phase primary with common primary and secondary neutral

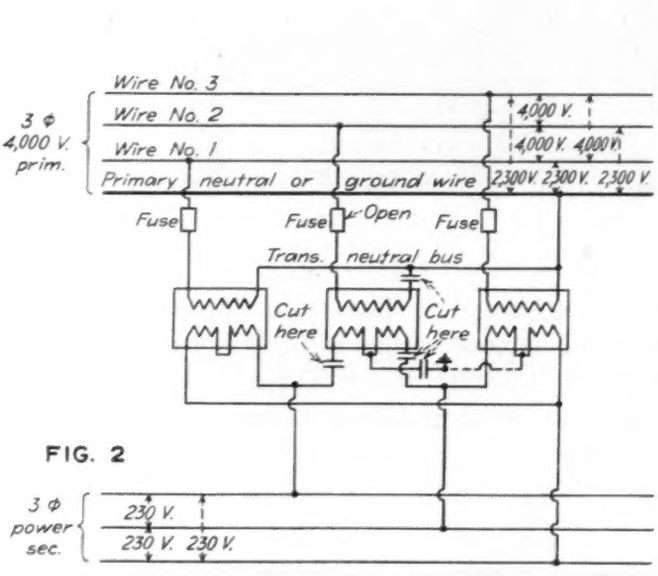


FIG. 2

FIG. 2—Transformer connections for 4-kv., three-phase primary with tap from line primary neutral to transformer neutral bus

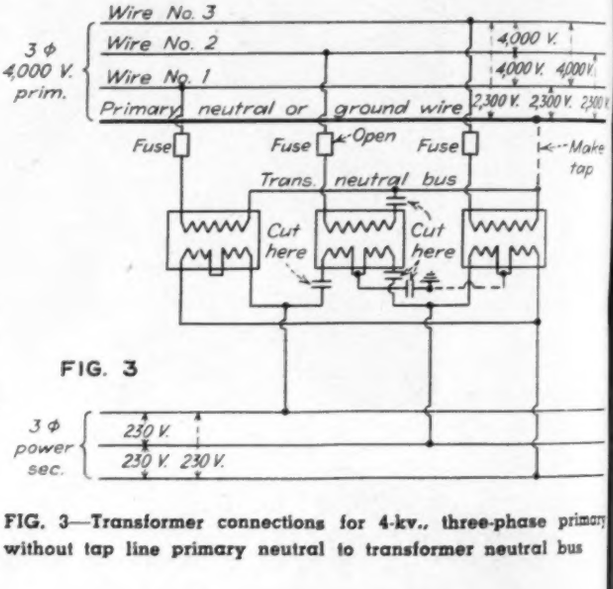


FIG. 3

FIG. 3—Transformer connections for 4-kv., three-phase primary without tap line primary neutral to transformer neutral bus

HOW YOU CAN HELP WAR INDUSTRY REDUCE OFF-THE-JOB ACCIDENTS

AN OPPORTUNITY FOR UTILITY LEADERSHIP!

What you can do and how G-E will help you do it

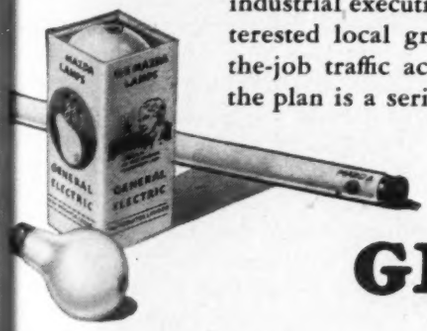
THE DIMMER THE LIGHT . . . THE GREATER THE DANGER

In 1942, 18,500 workers were killed at their jobs. Almost as many more were killed in street and highway accidents—two out of three of them *after dark.* And more than a half million additional workers were *injured* in off-the-job traffic accidents. Manpower loss from these 1942 highway accidents will add up to almost one billion man-hours. And despite lower speeds and reduced volume of traffic, *accidents involving workers are increasing.*

HOW YOU CAN HELP

Additional safety street lighting and supplementary or new auto head-lighting would help reduce these accidents, if sufficient critical materials were available. But the lighting industry can make an important contribution without them—giving proof once more of its resourcefulness and qualities of leadership.

Ready now is a plan by which utilities can help industrial executives and other interested local groups reduce off-the-job traffic accidents. Basis of the plan is a series of six posters and a plan of action designed to foster greater public and worker awareness of the dangers that exist.



HOW TO START

Ask your G-E Lamp Office for copies of the two booklets shown below and other material to help you start your program. "Off-the-Job Accidents" is a manual of facts about traffic accidents and shows how you can help industrial management save manpower. "Another Field for Utility Leadership" describes objectives and methods of organization. Get them from your G-E Lamp Office today. Or write General Electric Company, Dept. 166-EW-9, Nela Park, Cleveland 12, Ohio.

* * *

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G-E MAZDA LAMPS

GENERAL ELECTRIC

THE BEST INVESTMENT IN THE WORLD IS IN THIS COUNTRY'S FUTURE — BUY WAR BONDS

Load Distribution on Interconnections

Maximum possible efficiency (or minimum input for a given aggregate output) from a group of generating units operating in parallel can be obtained when all units are operated at such points on their input-output curves as to have the same slope for each. In a recent British paper by Paul G. Kaufmann in the April, 1943, *Journal of the I.E.E.* the loading strips of Johnson and Umbenhauer (ELECTRICAL WORLD, December 30, 1939) are translated into slide wire resistances as a step toward creating an automatic load allocator.

Slope curves of the stations are obtained and plotted as in Fig. 1 and below them the loading-strip scales for each along with one for the whole system output. These afford an opportunity to ascertain analytically the most economical load distribution for a definite set of local loads.

Automatic load distribution is achieved by replacing the loading strips by sliding-contact rheostats with resistances proportional to the output value indicated on each respective scale. With the sliding contacts mechanically connected to an arm (Fig. 2) so as to move jointly on a common vertical line in accordance with the required station output, the

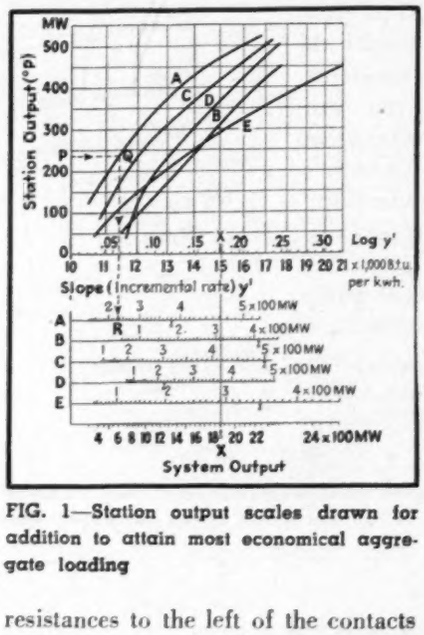


FIG. 1—Station output scales drawn for addition to attain most economical aggregate loading

resistances to the left of the contacts represent corresponding output values of the several units for most economical load distribution. Each resistance can then be used to control the corresponding output; this can be done by means of a bridge circuit wherein

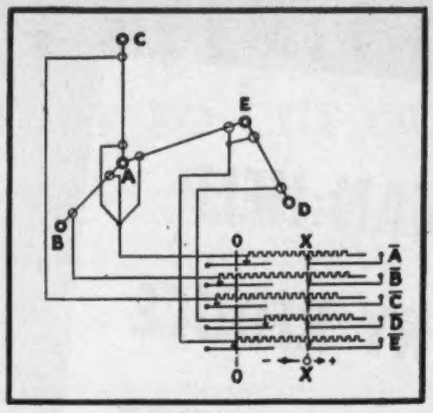


FIG. 2—Automatic load allocation obtainable by substituting graduated resistances for the output scales; tie-line loadings are controlled by regulators responsive to the tie-line loads

the "loading strip" resistance is balanced against another adjustable resistance actuated by a servo-motor, which, at the same time, adjusts the governor setting of the prime mover.

Proper safeguard has to be provided so that the output allocated to any station is within its range of safe operation. This can easily be done by extending the rheostats of the master load distributor in either direction by an amount of resistance of constant value corresponding to the minimum and maximum station output, respectively. When the sliding contact moves beyond the normal range of the station-output rheostat the output will thereby be maintained constant at its extreme safe value.

•

Parallel Conductors at River Crossing

Paralleling of two or more line conductors to provide carrying capacity need for growing war loads, as was done in a recent instance by Empire District Electric Company, Joplin, Mo., is a practical and effective expedient where single conductors of larger size are not available.

The Missouri company had interposed single 4A copperweld-copper conductors in a No. 1/0 equivalent 33-kv., 25-cycle transmission circuit at a 550-ft. river crossing. With the development of war loads this crossing became a bottleneck in the line, limiting its carrying capacity. The 2A equivalent copperweld copper conductor that engineers might have used to replace the smaller conductor was not available in stock.

To reinforce the circuit capacity, therefore, two 4A copperweld-copper conductors available in stock were pre-stretched on the ground—to equalize the tension between the two wires—and clamped together at 20-ft. intervals, using conventional split-bolt connectors. This "double conductor" was then strung in place, using the existing conductor as a pulling line. The two paralleled conductors were dead-ended in the existing clamps, which were large enough to take two conductors without trouble.

The original 4A copperweld-copper conductor had a conductivity equivalent to a No. 4 solid copper conductor (41,607-c.m.). By paralleling the conductors conductivity approximately equivalent to a single No. 1 solid copper conductor was obtained, thus eliminating the bottleneck.

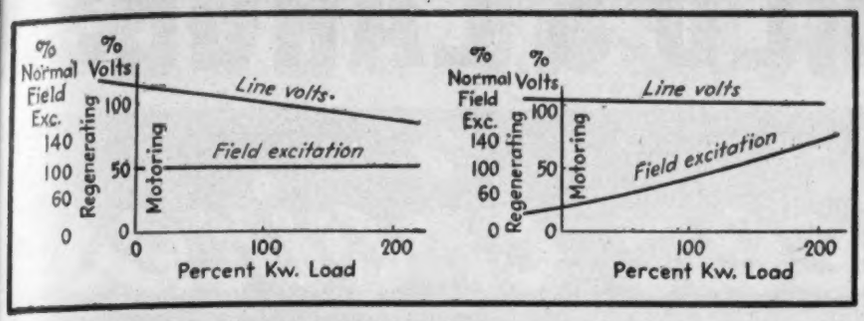
•

Power Factor Control Helps Shovel Voltage

By D. STOETZEL
Mining Division, General Electric Company

Electric equipment was recently installed in a large Western coal mine where seven electric shovels and draglines, stripping and loading bituminous coal, are supplied with power at 50 kv. over a line approximately 100 miles long. At this property the voltage is stepped down to 2,300 volts through 2,000-kva. and 1,000-kva. transformer banks located about a mile apart, both supplying the shovel distribution lines. All of the shovels have 0.8 power-factor synchronous motors on the motor-generator sets. A lighting load about midway along the 50-kv. line makes it necessary to keep voltage fluctuations as low as practicable. In addition, voltage might fall so low at the shovels as to permit motors to pull out of step on heavy loads, with resulting delay in operation and loss of production.

A study of the system indicated that suitable power-factor correction would keep the voltage fluctuations at the shovels within about 5 percent of normal. By the use of the amplidyne control equipment described in the following paragraphs excellent results were obtained. Line-voltage fluctuations were held within satisfactory limits, even under the heaviest loads. It was found that all the machines could be operated simultaneously, although the power line was originally



EFFECT of power-factor regulation on line voltage
With field excitation of shovel drive synchronous motor held constant (left) voltage drops as load rises. At right is result of using amplidyne to vary excitation and thus to control power factor.

laid out for only about half as much load. A set of tests on the largest shovel, a machine powered by a 900-kva., 0.8-power-factor synchronous motor, showed the following conditions:

	Without Amplidyne P.F. Regulation	With Amplidyne P.F. Regulation
Synchronous motor Field amperes	36 amp.	14 to 55 amp.
Minimum load	0	0
Approx. maximum regenerative load	400 kw.	400 kw.
Maximum load (motoring)	1,500 kw.	1,650 kw.
P.F. at maximum load.	0.96 lead	0.85 lead
Minimum line voltage.	1,850 volts	2,200 volts
Maximum line voltage.	2,600 volts	2,500 volts

With an amplidyne exciter operating as a buck and boost generator in series with the motor field across the regular constant-voltage exciter, it is possible by means of suitable connections of amplidyne control fields to hold unity power-factor throughout the range of loads. This insures minimum heating of the motor stator windings and greatly reduces the heating on the motor field windings. However, the voltage regulation will be improved still further by providing some lagging kva. at no-load and as much leading kva. as possible (within the limits of the motor characteristics) at maximum loads. Minimum excitation must be such as to allow the motor to handle suddenly applied loads. Maximum excitation must be such that it will not cause overheating of fields.

The beneficial effects of power-factor control are apparent from a consideration of the accompanying graphs, showing voltage variations at the shovel as load is applied, both with and without power-factor control. The use of synchronous condensers or capacitors for power-factor and line-voltage improvement has been found beneficial on many power lines. For large synchronous-motor-powered shovels the amplidyne power-factor control affords a means of obtaining similar advantages with very little additional equipment or expense. But it should be remembered that the primary function of the synchronous motor is to handle the shovel load. This, to some extent, limits the work it can do in correcting line-voltage conditions.

The advantages of this system of power-factor correction include:

(a) Improvement in load power-factor.

(b) Improvement in pull-out torque of synchronous motor.

(c) Line voltage is well maintained under even heaviest loads, thereby preventing motors from pulling out of step.

(d) Elimination of overvoltage at light loads.

(e) Reduction of light flicker due to sudden load changes.

(f) Reduced heating of synchronous motor fields.

(g) Reduced heating of synchronous motor stator windings.

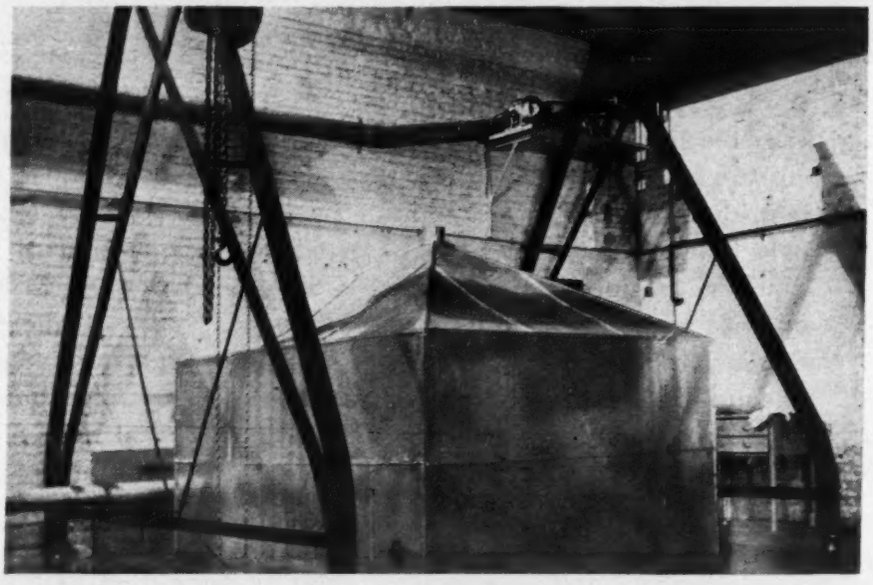
•

Cleaning Without "Raising a Dust"

In the Montana Street substation of the Montana Power Company, Butte, are two 600-volt, direct-current generators for supplying all electric elevators in the city, the farthest being about 1½ miles distant from the plant. One of these machines carries the load, the other acting as a standby. They are in the same room with the substation switchboard and other equipment, and when one was being given its periodic cleaning, by brushing and blowing out with air, the accumulated dust and copper particles had a way of rising up and settling right back on the other generator and the switching equipment. This made necessary more frequent cleanings.

Now the work is done under a galvanized metal hood, 10 ft. square by 6 ft. high, with no bottom. It is light enough so that four men can pick it up and set it over one of the machines. There is a stovepipe hole in the top, from which it can be connected by a removable piece of pipe with a pipe duct near the ceiling. In the far end of the duct is a fan, which exhausts air and dust from the interior of the hood to the outside of the building.

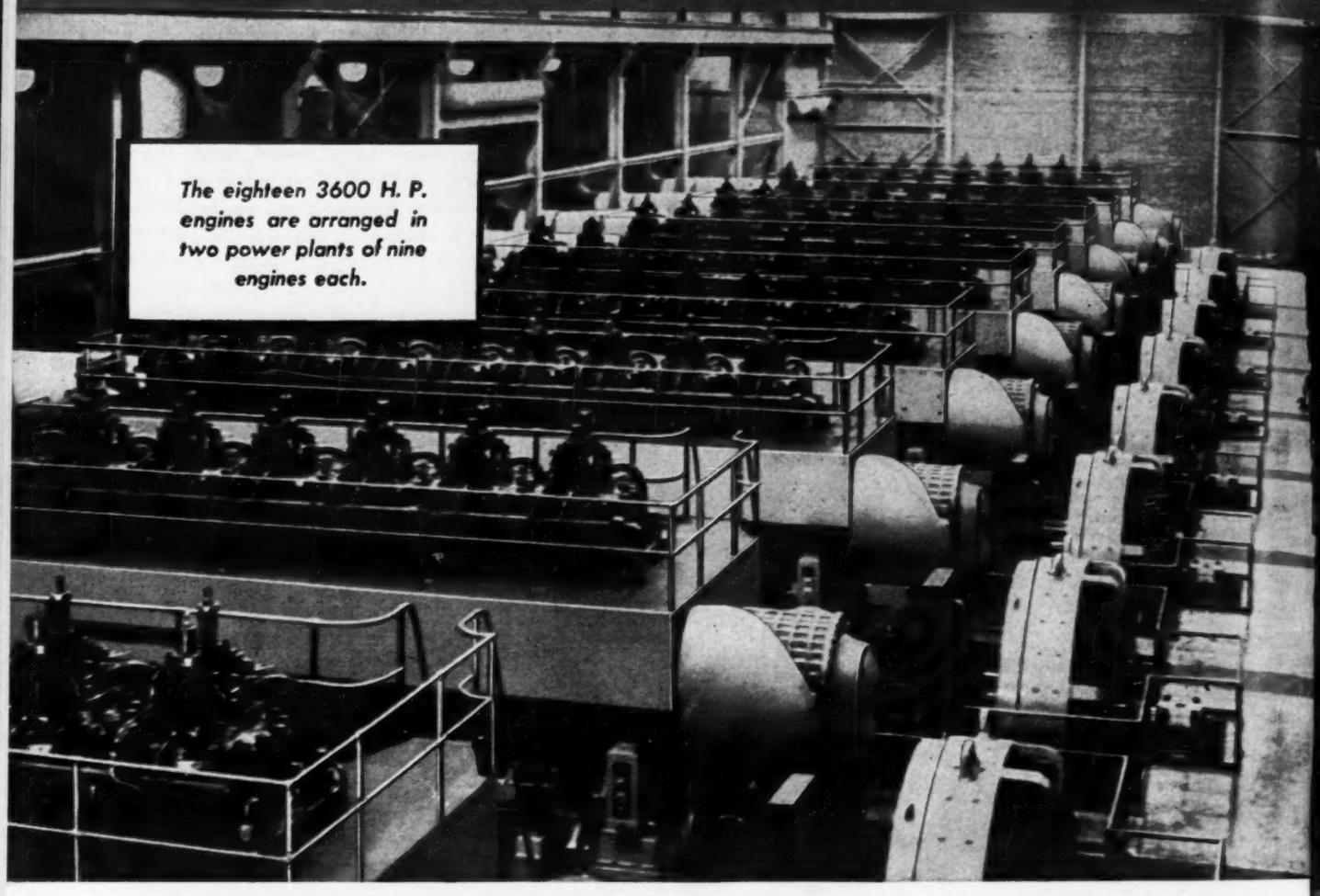
When cleaning, a man works inside the housing with brush and air hose, with no cries from the outside about "raising a dust."



SHEET METAL HOUSING built to inclose small generators while being cleaned; pipe at the top is connected with exhaust duct

The WORLD'S LARGEST

Eighteen Engines



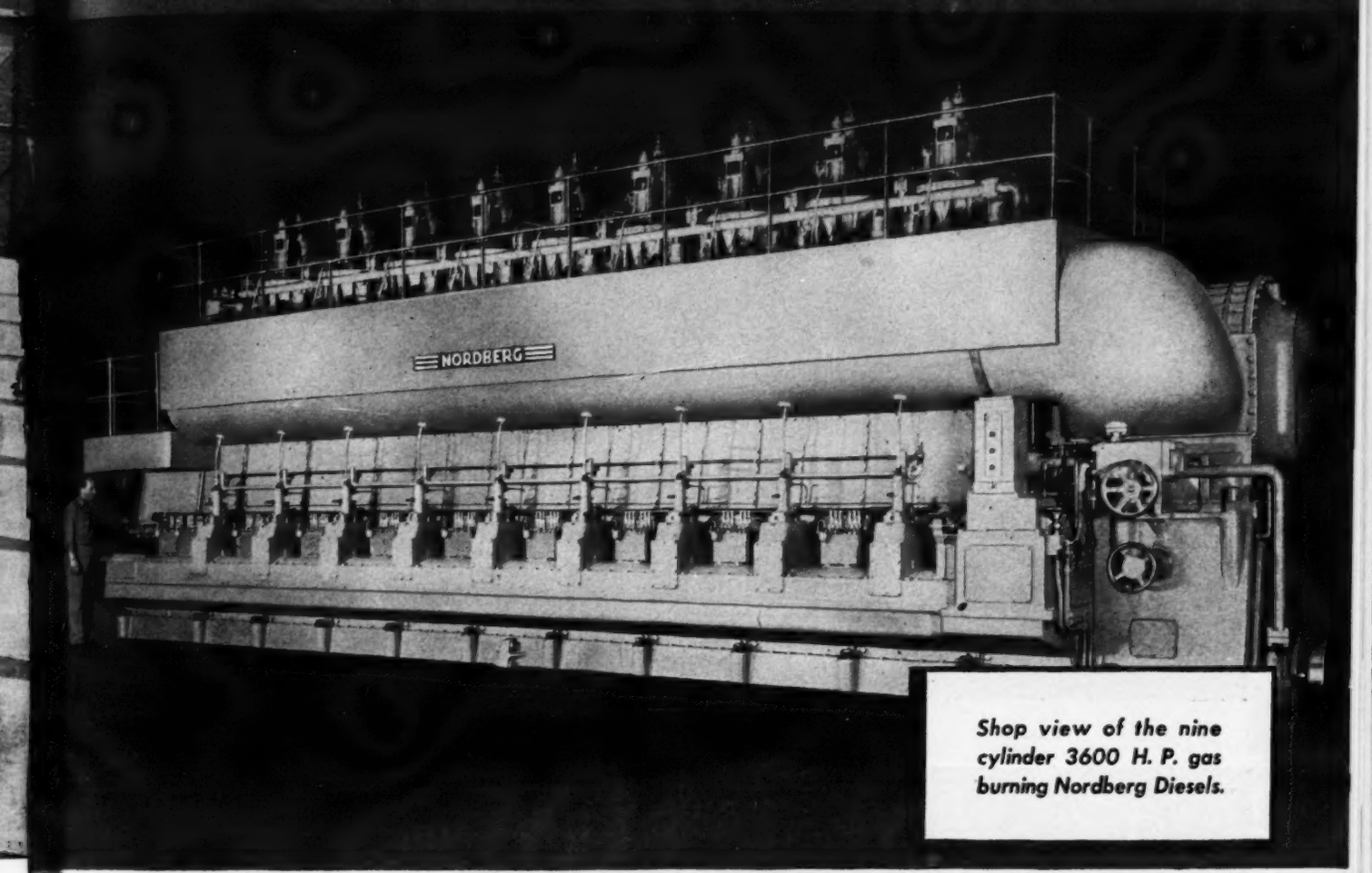
The eighteen 3600 H. P. engines are arranged in two power plants of nine engines each.

The selection of Nordberg engines for the world's largest Diesel engined power plant is added proof of the dominant position held by Nordberg as builder of Diesel engines in the larger sizes. These eighteen engines are part of our vital aluminum expansion program and were selected because of their ability to produce dependable power at low cost, an all important factor in the recovery of this metal so essential to the war effort . . . Because of wartime regulations, censorship prevents mention of the location of this installation which is furnishing an unfailing supply of energy and is giving the kind of performance that is being given by other installations of large Nordberg Diesels which have gone in service in recent years.

NORDBERG *Gas Burning*

T DIESEL INSTALLATION

65,000 Horsepower



Shop view of the nine cylinder 3600 H. P. gas burning Nordberg Diesels.

The engines installed in this record size Diesel power plant are of the gas burning type, a recent development which Nordberg has contributed to the Diesel power field. This type of engine operates on the full Diesel principle but burns natural gas. These gas burning Diesels, however, may be changed at any future time to oil burning without changing a single major engine part. The satisfactory performance of Nordberg gas burning Diesels now in service prove conclusively that this type of engine has outstanding merits wherever natural gas is available.

NORDBERG MFG. CO. • MILWAUKEE 7, WIS.

DIESEL ENGINES

PLACEMENT OF DANGER SIGNS AND NUMBERING ON TRANSMISSION TOWERS

Size, method of mounting and location of danger signs, as well as affixing of numbers on transmission towers, adapted from construction standards of the transmission and distribution department of Boston Edison Company

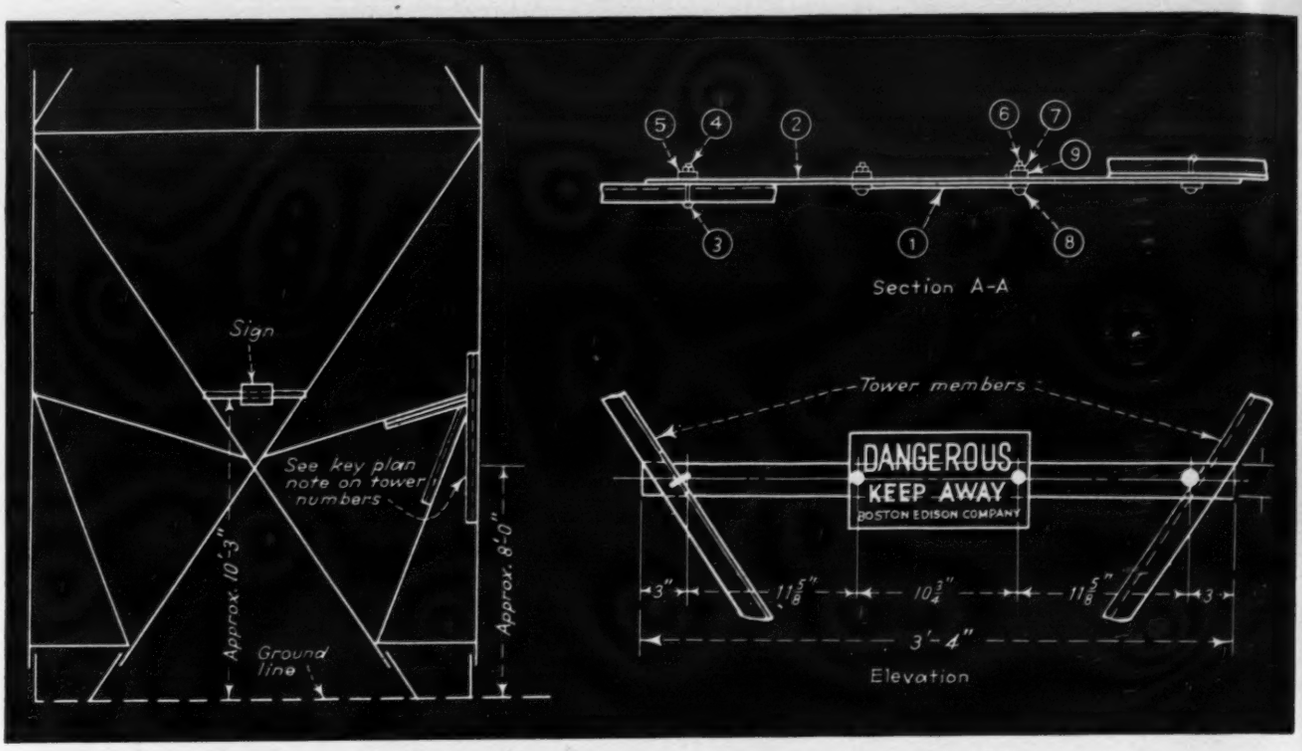


FIG. 1

FIG. 2

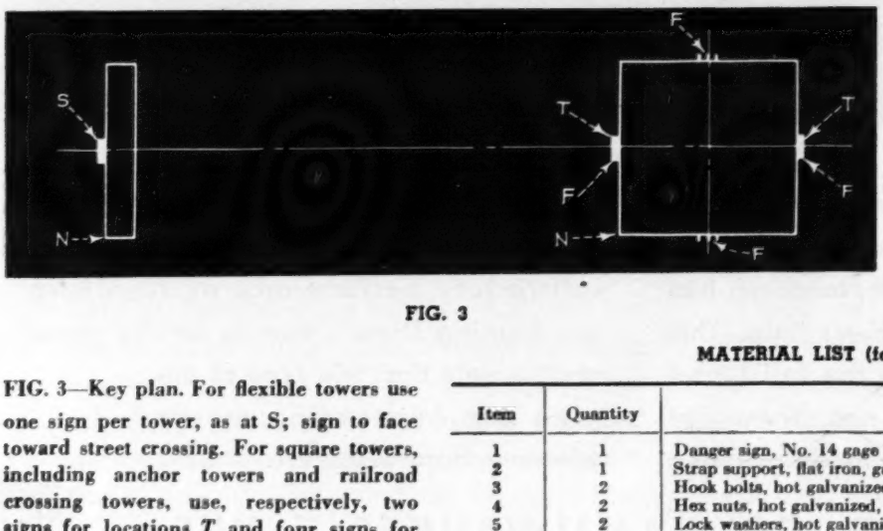


FIG. 3

FIG. 1—Arrangement of danger signs on a typical tower

FIG. 2—Detail for securing sign

FIG. 3—Key plan. For flexible towers use one sign per tower, as at S; sign to face toward street crossing. For square towers, including anchor towers and railroad crossing towers, use, respectively, two signs for locations *T* and four signs for locations *F*. Tower numbers are to be stenciled in black 3-in. figures on ONE leg of the tower, as indicated at *N*.

MATERIAL LIST (for One Sign Only)

Item	Quantity	Description
1	1	Danger sign, No. 14 gage iron, porcelain enameled, 6½ in. x 12 in.
2	1	Strap support, flat iron, galvanized, 2 in. x ¼ in. x 40 in.
3	2	Hook bolts, hot galvanized, ⅜ in.–16
4	2	Hex nuts, hot galvanized, ⅜ in.–16
5	2	Lock washers, hot galvanized, for ⅜ in. diam. bolts
6	2	Screws, rd. hd. brass machine, ⅜ in.–16 x 1¼ in. long
7	2	Hex nuts, brass, ¾ in.–16
8	2	Washers, lead, ¾ in. O.D., for ¾ in. diam. screws
9	2	Washers, lead, 1½ in. O.D., for ⅜ in. diam. screws

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CLEVELAND (14),	1394 E. 39th St.,	HEnderson 5750 Teletype CV. 153
MILWAUKEE (1),	4027 West Scr't St., P. O. Box 2045	Mitchell 7500 Teletype MI. 587
NEWARK, N.J. (1),	Foot of Bessemer St., P. O. Box 479 Teletype NK. 74	Bigelow 3-5920 REctor 2-6560 BErgen 3-1614
PITTSBURGH (12),	1281 Reedsdale St., N. S.	CEdar 7700 Teletype PG. 475
ST. LOUIS (3),	21st & Gratiot Sts.,	MAin 5235 Teletype SL. 384
TWIN CITY,	2545 University Ave., St. Paul (4), Minn.	NEstor 2021 Teletype STP. 154

UNITED STATES STEEL SUPPLY COMPANY
(formerly Scully Steel Products Company)

UNITED STATES STEEL

Condenser Field Rewound in Shop

The Southern California Edison Company has completed the job of reinsulating the field windings of one of the 30,000-kva. synchronous condensers at Laguna Bell substation. The work, which was done at the company's shop and test division in Alhambra, was one of several of its kind which have been done in the past, and another is contemplated for the future. The reinsulated field windings give as good service as new windings in a modern machine.

One of the first operations is to clean up the copper. Special tools were made for air hammers used in splitting the turns apart. After the turns of the coil are separated, it is immersed in a caustic solution and boiled for several hours. This loosens the insulation so that it can be washed off with a stream of clear water. The coil is then suspended on a pipe rack and smoothed up by sanding, partly by hand and partly by motor-driven portable disk sanders.

The coil is now ready for the application of the new turn insulation, which consists of one sheet of mica between two sheets of asbestos paper. The old method of applying the sheets of insulation with the aid of shellac and clothes pins (Fig. 1), has given way to an improved method (Fig. 2) which is less tiring for the workers and more economical in labor, and also affords a saving of shellac, which is now a critical material.

The coil is next placed in a steel press, where it can be brought down to exact size during the baking process. Temperature is controlled by passing direct current through the winding. A final temperature of 165 deg. C. is sufficient to polymerize the shellac and the coil comes from the press with turns stuck together in a solid mass. The excess of hardened shellac and the protruding edges of the turn insulation are cleaned off and the coil is tested to make sure that no turns are shorted.

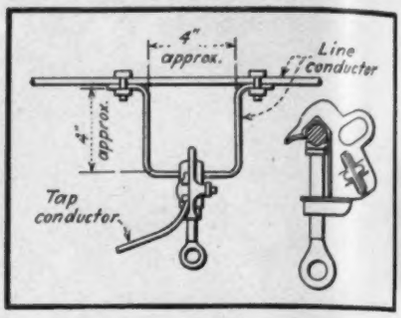
Boxing (insulating pad between pole piece and coil), consisting of mica, paper, asbestos cloth, muslin, shellac and bakelite varnish, is built up inside the coil and held in place by wood forms. Further baking sets the boxing in place in a solid mass. When the wood forms have been removed and the boxing trimmed and varnished the completed coil is installed on its pole piece, ready for a high voltage test to ground.

A final test for shorted turns is made with the pole piece in place. The completed unit is now ready for crating for shipment. If coils are not to be shipped with pole piece in place, a different type of crating is necessary.

In reinsulating the coils mica has been added between turns. This is now standard practice with the manufacturer, but was not when the condenser was built.

Saddle Tap Stops Strand Breaks

Where hot tap clamps are connected directly to stranded copper conductors vibration may result in the breakage of strands and weakening of the conductor. Kansas Gas & Electric Company has solved the problem, as shown in the accompanying illustration, by connecting a 4x4-in. wire "saddle" to the line conductors with split bolt connectors and then fastening the hot tap clamp to the saddle. The saddle shown is used for hot tap clamp connections to No. 4 and smaller copper, 3 No. 10 C.W. and steel line conductor.



MAKE hot-tap connections to wire saddle to reduce strand breakage caused by conductor vibrations

If the tap wire, leading away from the hot tap clamp, is short and subject to vibration, an 8-in. diameter loop is made in it, also to avoid vibration breaks.

FIG. 1—Superseded method employed horizontal arrangement; clothespins held asbestos and mica sheets until shellac set; four men sticking, two applying shellac

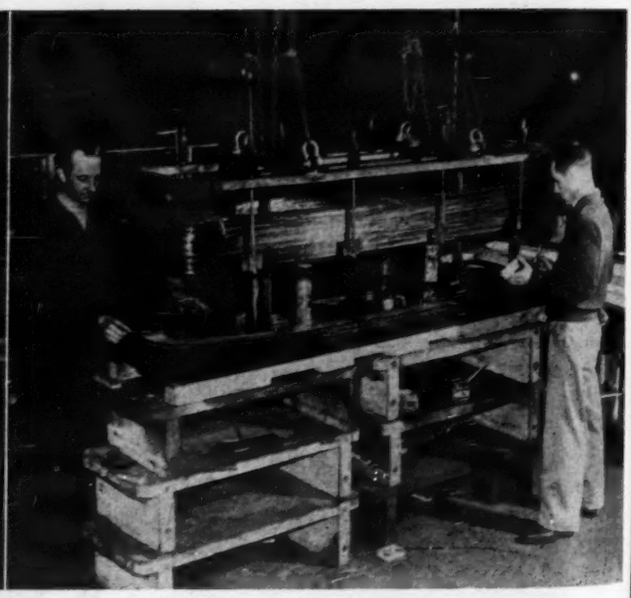


FIG. 2—Improved vertical handling with coil jig arranged to drop one turn at a time; eight toggle-bolts drop clip angles free to swing out and loose turn falls

GET THE INSIDE STORY... APPLY THE KNIFE-TEST TO ROCKBESTOS A.V.C.

Take a sample of Rockbestos A.V.C. Power Cable (illustrated) or similarly insulated Motor Lead Cable, slit open the slick-finished, heavy asbestos braid (1) impregnated with heat, flame and moisture resisting compounds—a braid that won't dry out, crack or flow under heat, won't bloom, swell or rot as a result of contact with oil or grease, and won't burn or carry flame—and beneath it you will find a fire-wall of felted asbestos (2).

1

2

Cut through this felted asbestos firewall (2) also impregnated with heat, flame and moisture resisting compounds to provide a permanent protecting wall against high ambient temperatures that won't bake brittle or crack with vibration, and when you peel it back you will see the high-dielectric, moisture-resistant varnished cambric tape (3) it protects from heat, flame and oxidation.

3

Now unwind the lubricated varnished cambric tape (3) and you will see the obvious advantage of helical multi-layer tape application—*not one thickness, but many*—for uniform coverage, for dielectric stability and to assure, together with the helically applied felted asbestos, perfect and permanent centering of the conductor in the insulation.

4

Under the tapes you will notice another felted asbestos firewall (4). An inner heat-barrier to complete the protection of the varnished cambric, put there to prevent the heat of overloads from attacking the tapes. It won't ignite or burn even when exposed to copper-melting arcs. Now slit this felted wall and peel it back, and you'll see beneath a thin layer of paper (5) over the conductor.

5

This cigarette-thin layer of paper (5) doesn't look like much but it has an important function. It is employed as a separator to keep insulation and compounds out of the conductor so that it will be clean and strip easily. And that completes the story of the construction of Rockbestos A.V.C. *the wire with permanent insulation.*

Try the simple test outlined above on a sample of Rockbestos A.V.C. wire or cable of your selection, which we will send on request, and you'll readily see why *permanently insulated* Rockbestos resists heat, flame, moisture, corrosive fumes, oil and grease—and gives long-lived service under high operating temperatures and severe conditions.

Rockbestos A.V.C. Power and Motor Lead Cables and Lighting Wire (Underwriters' and National Electrical Code, Type AVA) have a maximum operating temperature rating of 110° C. (230° F.), and will not bake brittle, crack, bloom, swell or rot. Send for a sample and make your own jack-knife test. Write to us at New Haven or the nearest branch office:

ROCKBESTOS PRODUCTS CORPORATION
910 Nicoll Street, New Haven 4, Connecticut

ROCKBESTOS A.V.C.

The Wire with Permanent Insulation

FOR VICTORY ★ Invest in United States War Bonds ★

NEW YORK, BUFFALO, CLEVELAND, CHICAGO, PITTSBURGH, ST. LOUIS, LOS ANGELES, SAN FRANCISCO, SEATTLE, PORTLAND, ORE.

Use Reclaimed Parts, Salvage Copper Wire

By ARTHUR H. BARDEWYCK
Assistant Chief Engineer
Cia. de Electricidad del Sud Argentino, S. A., Buenos Aires, Argentina

In order to utilize multi-strand conductor of large cross-section as well as single-strand conductor of small cross-section which had been salvaged from various distribution reconstruction projects, two machines were developed. One machine was designed for "breaking down" large multi-strand conductors to conductors of suitable cross-section; the other machine for "making up" stranded conductors of any desired cross-section from single-strand conductors of small cross-section.

Material obtained from the distribution yards plus some parts available from a street car maintenance shop were utilized in building the machines. Accompanying illustrations indicate the simplicity of the equipments.

Machine for breaking down large cables into three smaller conductors is shown in Fig. 1. In practice only the center or core conductor can be utilized immediately, as the two conductors wound on the reels are too loosely formed to permit immediate utilization without further modification. The latter conductors are further broken down until only a single-strand conductor remains. The individual strands are classified according to size and placed on small cable reels. Ends of the single-strand

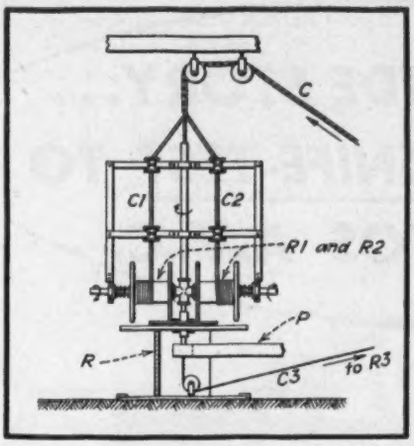


FIG. 1—Machine for breaking down one large cable *C* into three separate conductors C_1, C_2 and C_3.
First two conductors are wound on small reels R_1 and R_2 rotating on top of a large cable reel *R* used as a base; conductor C_3 is a single strand wound on a reel R_3 and ready for immediate use; *P* is belt to driving motor.

conductors are joined by silver brazing.

Machine for making up stranded conductors, utilizing salvaged single-strand conductors, is shown in Fig. 2. One side of a large cable reel is fixed to a line shaft and has mounted on it several smaller reels which are free to rotate about their axis and which carry the individual strands.

An electric motor drives the line shaft by pulleys and a belt. The main shaft drives a second shaft, which in turn actuates a winding drum through two pairs of 1:1 ratio bevel gears. The winding drum pulls the cable through a pair of grooved drums held together by springs under pressure. The cable is formed and made compact by these grooved drums.

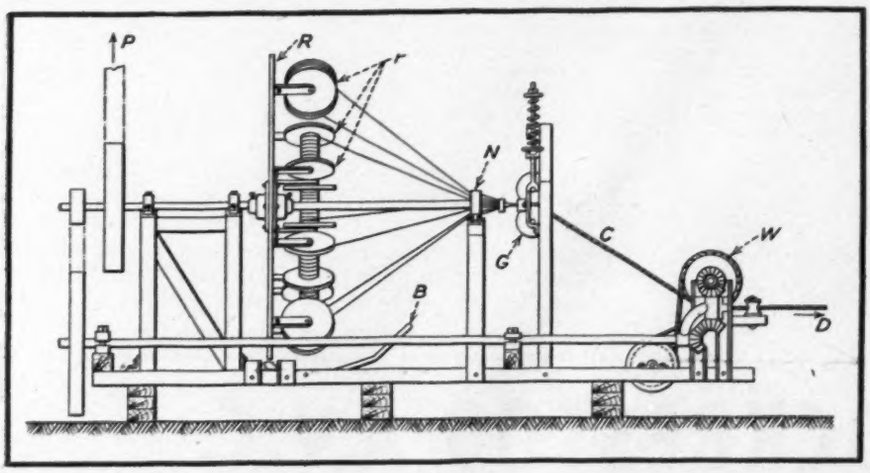


FIG. 2—Machine for making up multi-strand copper conductor *C* from salvaged single-strand conductors on small reels, *r*, mounted on a side of a large cable reel, *R*. Power is supplied through belt *P* and machine is stopped by brake *B*. Individual strands pass through a cone, *N*, and wound. The stranded conductor is shaped in grooved drums, *G*, being pulled by winding drums, *W*, and passed to reel, *D*

•

How a Blotter Filter Press Purifies Oil

By HOBART E. ROWE
University City, Mo.

For removal of water, acid, sludge and other contaminants from insulating oils various types of oil purifiers are available. Four principal types are: (1) Blotter filter press, (2) the centrifuge, (3) fuller's earth filter, and (4) activated alumina. In addition combinations of equipment are used for batch treatment.

An outline of the fundamental characteristics of the four oil purifiers is being presented. The blotter filter press is covered in this article. The centrifuge type was described in ELECTRICAL WORLD, August 21, 1943, page 94. The other two types will be outlined in as many subsequent articles.

Blotter Filter Press—In this equipment oil is pumped through a number of sets of dried filter papers. Two results are accomplished:

1. Water is removed from the oil by the blotters, which consist of cellulose fiber and have a great affinity for water.
2. The coarser sediment is mechanically strained out of the oil.

Limitations of the blotter filter press are:

1. Time required to make numerous changes of paper necessary to obtain dry oil is such as to make this method of purification impractical if large quantities of water are in the oil.
2. Filtering through blotters does not materially reduce organic acidity or improve resistance to emulsification. It does not remove finely divided carbon from the oil.
3. Efficiency of the filter press for removing carbon increases as the pores of the blotter become partly clogged and are restricted due to swelling of the fiber as water is absorbed. This produces a definite slowing down of the rate of flow through the blotter. The filter paper is best as a mechanical strainer when it is wet and at the end of its usefulness as a water absorber.
4. Power is required for the pump, also the oven for drying the blotters.

IF YOU need another source of supply for your insulating materials, it will pay you to investigate The National Varnished Products Corporation.

For here is a group of old hands in the development and production of varnished insulating materials—with up-to-the-minute machinery and equipment — and — equally important — a keen appreciation of today's wartime needs.

It is a source of supply you can depend upon for Varnished Cambric, Canvas, Duck, Acetate and Papers of high quality and uniformity — in a full range of thicknesses, sizes and finishes — for immediate delivery.

Write, wire or phone us your requirements and we will ship at once either from conveniently located wholesalers stocks or from our own. We welcome emergency orders.

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- Varnished cable tape
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PROCEDURE FOR INSPECTION OF LADDERS

A list of principal items to be noted as well as some detailed items for regular routine inspection have been adapted from Industrial Data Sheet D-Gen. 5 issued by the National Safety Council, Inc., Chicago, Ill.

PRINCIPAL ITEMS

The principal items to be observed in the inspection of ladders are as follows:

1. INSPECTION AFTER RECEIPT OR ERECTION

All ladders promptly after receipt or erection should be inspected to make sure they meet the requirements of the American Standards Association "Safety Code for the Construction, Care and Use of Ladders," unless state laws or local ordinances specify more rigid requirements.

2. PRESERVATIVES

Ladders if of wood should be given a coat of linseed oil as a preservative. Paint is satisfactory for metal ladders, but should not be used for wood ladders, as it conceals defects which may not be noticed on inspection.

3. MARKING

Each ladder should be marked in a conspicuous manner as to the principal purposes for which it is to be used and, if portable, also marked with the name of the department to which it belongs. In many companies all ladders are numbered consecutively so none will be overlooked during inspections.

4. STORAGE

Ladders when not in use should be stored in sheltered places provided for that purpose. Satisfactory methods of storing are:

A. Hanging the ladders upon brackets against a wall. If the ladders are long, there should be more than two supports to prevent permanent warping.

B. Placing them upright at an angle of 75 degrees.

C. Placing them on edge on racks or on rollers rather than flat. This will prevent trouble and danger in withdrawing a ladder for use.

REGULAR ROUTINE INSPECTION

Some of the items to be noted on the regular routine inspection of ladders are:

A. General:

1. Loose steps or rungs (these are considered loose if they can be moved at all with the hand).
2. Loose nails or screws and bolts.
3. Loose and missing shoes or anti-slip bases.
4. Cracked, split or broken uprights, braces, steps or rungs.
5. Slivers on uprights, rungs or steps.

B. Stepladders:

1. Shaky (due to side strain).
2. Loose and bent hinge spreaders.
3. Stop broken on hinge spreaders.
4. Chipped steps.
5. Loose hinges.

C. Extension Ladders:

1. Loose or missing extension locks.
2. Defective locks that do not seat properly when ladder is extended.

D. Trolley Ladders:

1. Worn or missing tires (lack of these causes floor wear and the ladder to roll bumpy and hard).
2. Binding wheels.
3. Floor wheel brackets broken or loose (these defects cause the wheels to travel off a straight line and work hard).
4. Floor wheels and brackets missing.
5. Ladders binding in guides.
6. Ladder and rail stops broken, loose or missing.
7. Rail supports broken or section of rail missing.
8. Trolley wheels out of adjustment. (This may allow ladder to run off rail.)

E. Trestle Ladders:

1. Loose in hinges.
2. Shaky.
3. Loose or bent hinge spreaders.
4. Stop broken on hinge spreader.
5. Center section guide for extension out of alignment.
6. Defective locks for extension.

F. Roofers' Ladders:

1. Loose or missing grab hooks.
2. Shaky.

G. Window Washers' Ladders:

1. Open pail hook.

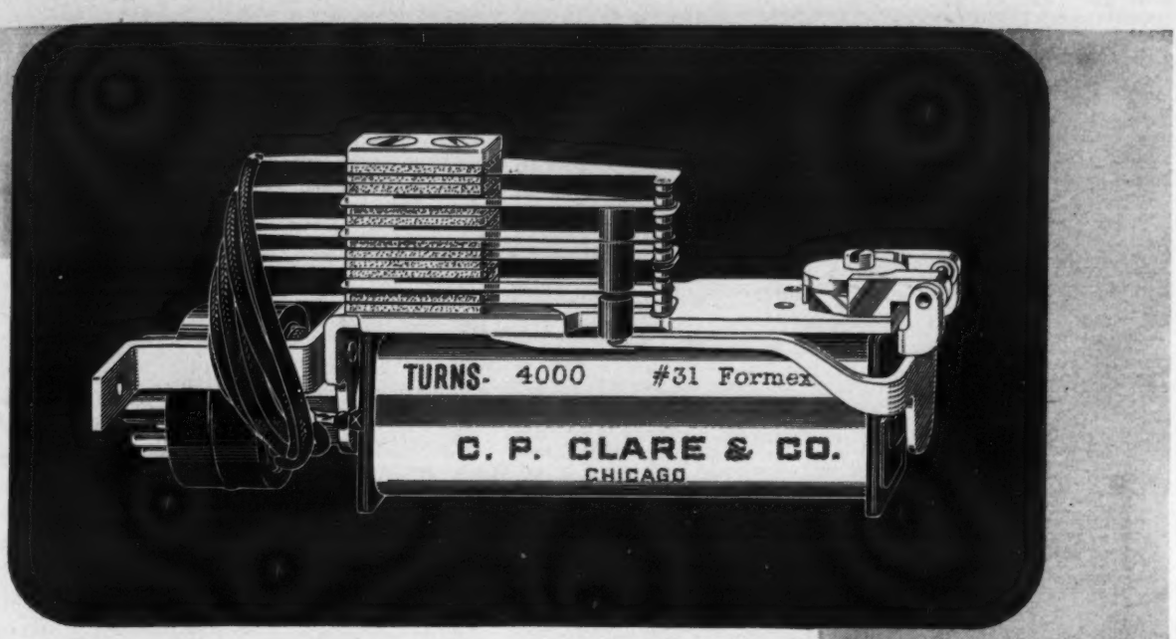
NON-USE OF DEFECTIVE LADDERS

All ladders found on inspection to be defective in any way should be so marked, and the use of such ladders should be strictly prohibited until after the defects have been properly corrected.

* * *

NOTE X—In many companies, portable and extension ladders are frequently tested as a part of the inspection procedure, by supporting each side rail horizontally at two points and then imposing a weight of about 150 pounds near the center of the ladder. This will help the inspector to detect serious defects such as cracks, splits and checks.

NOTE Y—Additional information on the subject of ladders will be found in Safe Practices Pamphlet No. 1, "Ladders."



LOW VOLTAGE — LOW CURRENT CLARE "CUSTOM-BUILT" RELAYS for pilot and supervisory systems

The Clare "Custom-Built" Relay is a simple, rugged multiple contact relay. It is especially valuable for use in operating control panels, supervisory control boards and load dispatching centers where signals are indicated from remotely located switches, circuit breakers, network protectors and other equipment.

Dependable operation and long life are built into Clare Relays by meticulous attention to design, fine materials and precise manufacturing.

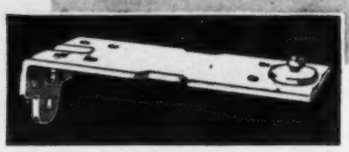
Spring pile-up insulators are of special heat treated Bakelite, which provides more favorable characteristics than triple "X" Bakelite and permits punching without cracks or checks. It has minimum cold flow properties and low moisture absorption content.

Contacts of rare metal or special alloys are available in sizes from .062" to .1875" diameter, flat or hemispherical.

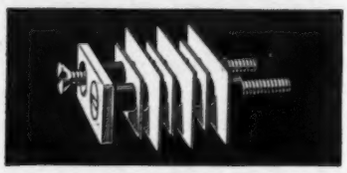
Contacts are welded to *nickel silver springs* by a special process that makes them an integral part of the spring, reducing moisture, providing rapid heat dissipation and insuring longer life.

Strong, hard, long wearing *Bakelite bushings* are made from Bakelite rod under patented process, providing ruggedness to withstand heavy contact pressure and vibration impossible to attain with hard rubber bushings.

Clare Relays are really "Custom-Built" and they are supplied with proper mountings for every application. Let our engineers apply this "custom-built" principle to your specific relay problem. Send an outline for our suggestions. Catalog and data book on request. C. P. Clare and Co., 4719 Sunnyside Avenue, Chicago (30), Illinois. Sales engineers in all principal cities. Cable address: CLARELAY.



Heel piece of special magnetic metal, annealed to provide high permeability at required flux densities, low eddy current loss and low hysteresis loss.



High voltage pile-up insulation consists of two flat or filister headed screws of high tensile strength, specially heat treated.

Armature assembly consists of armature of special magnetic metal; stainless steel shaft, operating in Oilite bearings, inserted in a hard brass yoke assuring minimum wear with consequent quiet and l ng life operation.

CLARE RELAYS

"Custom-Built" Multiple Contact Relays for Electrical, Electronic and Industrial Use

One of Four Cables Is Three-Phase Spare

By PAUL LOUIS DELLIS

Chief Engineer, Construction Department, Amitas, Ltd., New York

Several schemes have been studied to insure with the least possible expenditure the continuity of supply of transmission lines laid underground in urban areas; a scheme involving a system of four cables with one as spare has been used in South America (Buenos Aires). The underground 50-cycle transmission consists of a system of four single-phase, oil-filled 66-kv. cables, one of which is a reserve unit. Length of the transmission is 31.5 miles (50 km.). It is probably the longest underground transmission line in the world. Each cable is provided for a permanent capacity of 380 amp., which corresponds to a load of 43,500 kva. Neutral points of the transformers at both transmitting and receiving are solidly grounded.

The equipment of three cables at the transmitting end consists of two sets of three disconnecting switches, single pole, single throw, to connect the cables to the main busbar or to the auxiliary busbar; three oil circuit breakers, single phase, electrically operated; one set of three disconnecting switches, one for each cable, near the terminal box, normally closed; three current transformers; three potential transformers.

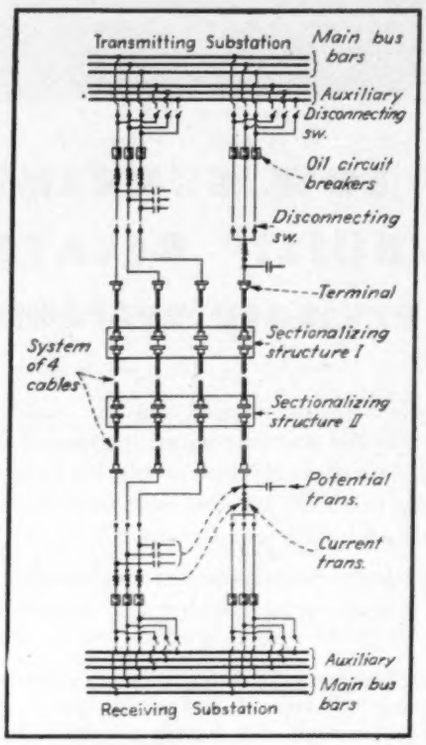
The equipment of the fourth cable at the transmitting end consists of two sets of three disconnecting switches, single pole, single throw, to connect the fourth cable to the main busbar or to the auxiliary busbar; three oil circuit breakers, single phase, electrically operated; one current transformer; one potential transformer; one disconnecting switch near the terminal box, normally closed.

Duplicate Equipment

The equipment at the receiving end is the exact duplicate of the equipment at the transmitting end.

Normally, the power is transmitted by three cables; the fourth cable is in reserve. All the busbar disconnecting switches of the three working cables and the fourth cable are closed on the same main busbar; the three single-pole breakers of the three working cables are closed; the three single-pole breakers of the fourth cable are open. If something happens to one of the working cables, a defect such as short-circuit to ground, this cable is tripped at both ends; the fourth cable will replace it. This replacement can be made (a) by automatically tripping the single-pole breaker of the damaged cable and manually closing the breaker of the fourth cable in the two end substations; (b) by automatically tripping the single-pole breaker of the damaged cable and by automatically closing the corresponding breaker of the spare cable.

Of course the three disconnecting switches of the fourth cable must be closed on the same main or auxiliary bus as those of the three working cables; to avoid short circuits resulting from simultaneously closing two single-pole breakers of the fourth cable, these breakers must be mechanically interlocked; such interlocking has the duty to prevent the simultaneous closing of two single-pole breakers and to allow only the suitable breaker to close.



TRANSMITTING and receiving ends identically arranged; reserve cable replaces faulted cable by automatic or automatic-manual means; 31-mile line divided into three equal sections

At the first third of the line there is a sectionalizing structure with eight cable terminals where the four incoming cables are connected to the four outgoing cables by means of loose connections; at the second third of the line there is a duplicate sectionalizing structure. Each of the four cables is therefore cut in three equal sections which are electrically symmetrical. In the case of two simultaneous defects affecting different phases and different sections, it is easy to re-establish quickly a single-phase line by connecting undamaged sections (see schematic diagram).

Along the main feeder there are two auxiliary cables, which are: One telephone cable and one pilot cable provided with 16 conductors of sq.mm. each; these conductors are insulated for 10 kv. against earth; eight conductors will be used to insure the automatic commutation of the spare cable; three conductors are used to control the oil pressure in the several manholes. The remaining conductors are spares.

The above description shows that the four-cable feeder with its switching devices has in itself plenty of spare capacity; the cost of this spare capacity is low; the fourth cable gives practically 100 percent spare, corresponding to the expenditure of one additional single-phase cable; the combinations resulting from the operation with only two cables and from the sectionalization of the line add much flexibility, which can be used to insure the continuity of supply.

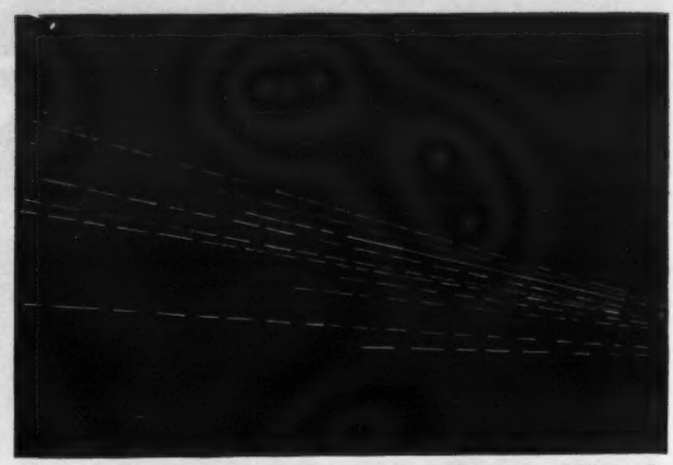
•

Cooling Tower Ups Generator Capacity

Following a stator failure in 194 a slight design change was made in rewinding a 37,500-kva. 0.80 p.f. generator at Horseshoe Lake station of the Oklahoma Gas & Electric Company. The effect of this change was to cause the machine to exceed safe operating temperatures during summer months when operating at full load rating and with the existing air cooler. The reduction in capacity of the generator, to keep within safe operating temperatures, varied with the temperature of water delivered to the generator air cooler and ranged from 5,000 kva. with 100 deg. F water to zero with 88 deg. water.

With the advent of war loads, it became necessary to develop the full capability of all machines at this station under all conditions. Reduction in the temperature of raw lake

1. Mounting enemy plane crack-ups result from . . .



2. . . . the superior equipment and shooting ability of American pilots.

3. One equipment requirement is an ample supply of strong, well-made ammunition belts to feed the bullets through the guns.

4. To meet this demand, looms for weaving the belts were speeded up and the motors operating the looms were frequently overloaded.

What one man and 40 loom-motors did about it

To quote from the Plant Superintendent's letter:

"Early in 1942, we installed 40 new narrow-fabric looms, individually driven by glass-wound motors . . .

"Since the installation of the looms, we have overloaded them to step up production, but this has had no adverse effect on the motors whatever. We are very pleased with their performance, and they certainly are neat and compact. Believe me, all motors purchased for my division will be glass-wound motors in the future." (1)

The glass in these motors is Fiberglas* Electrical Insulation.

This insulation can withstand frequent overloading . . . just one of the reasons why design engineers, plant superintendents, and maintenance men are using increasing amounts of Fiberglas for important wartime applications.

They are using the low space factor of Fiberglas to make smaller, lighter, more compact equipment. They are skillfully combining it with suitable impregnants to take advantage of its great resistance to moisture, acids, corrosive vapors, and other causes of insulation breakdowns.

Used by Services

The Army and Navy have also recognized these qualities of Fiberglas and are finding increasing uses for it in the important fighting equipment—from battle ships to airplanes.

Since these vital Army and Navy requirements come first, even the constantly increasing production of Fiberglas electrical insulation is sometimes strained. But there is still enough to take care of those jobs where Fiberglas is the only suitable material.

Ask your electrical distributor for technical data on Fiberglas and its availability for your war use. Or write: *Owens-Corning Fiberglas Corporation, Toledo, Ohio. In Canada, Fiberglas Canada, Ltd., Oshawa, Ontario.*

(1) Name on request.

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*T. M. Reg. U.S. Pat. Off.

ELECTRICAL INSULATIONS

The Lock that never "Forgets"

DANGER KEEP OUT

Safety rules governing the use of dangerous equipment are in force in virtually all Power Plants. Yet costly accidents frequently occur . . . very often because someone *forgot!*

So why not replace human frailty with mechanical infallibility? Put to work the Safety Men of *"The Invisible Crew"*... install BENDIX-CORY* SAFETY INTERLOCKS.

These life and property saving units *never* forget. They make untimely or unauthorized access to dangerous equipment *impossible*. They keep such equipment, compartments or switches locked in use... or locked out of use... until the operator has opened other switches, closed doors, or in other ways complied with all of your safety regulations.

With BENDIX-CORY SAFETY INTERLOCKS you can *interlock* any number of points indoor or out, thus providing positive safeguards against accident. Write for full information. Let Bendix engineers help solve your problem.

*TRADE MARK OF BENDIX AVIATION CORPORATION

Products of this division are members of "The Invisible Crew"—precision equipment which 25 Bendix plants from coast to coast are speeding to our fighting crews on world battle fronts.

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Precision Equipment by
Bendix
AVIATION CORPORATION

MARINE DIVISION • One Hanson Place, Brooklyn, New York

water delivered to the air cooler o an improvement in air cooler ef ciency was necessary. Three metho of achieving this were considered (1) An increase in the size of ge erator air cooler fans and a reductio in duct losses; (2) cooling the wate with vacuum jets, or (3) installatio of a cooling tower. The latter metho was selected as the best solution sinc it involved the use of less critica material.

An induced-draft cooling tower, ft. square, 15 ft. high and weighin about 10 tons wet, was installed o the plant roof. This tower is of re wood and is capable of cooling 70 g.p.m. of water from 100 deg. to 8 deg., with a wet bulb temperature o 75 deg. No pumps were needed fo the tower since it was found tha service water pumps, taking wate from the lake and delivering it at 7 psi. to the service water header, ha sufficient head to pump 700 g.p.m over the tower. Accordingly wate from the service water header wa piped to the cooling tower, fro which point it returned by gravity t the air cooler and was discharged t the lake.

Reduced Pump Load

This arrangement actually reduce the load on service water pump Formerly between 1,200 g.p.m. an 1,500 g.p.m. of raw lake water at th higher temperature was taken fro the service water header for the ge erator air cooler. By reducing th water temperature in the tower, ge erator air cooler requirements wer reduced to about half this amount, 700 g.p.m., thereby reducing the loa on the service water pumps by a lit amount.

As the generator air cooler is no operated, condensate is used in th air cooler during winter months. A temperature increases a shift is mad to raw lake water, and finally in ex treme summer weather the raw lak water from the service water heade is put over the tower, cutting i temperature to an average of 10 de F. Full capability of the machine thus attained under all weather con ditions. Life expectancy of the ge erator insulation is also extended.

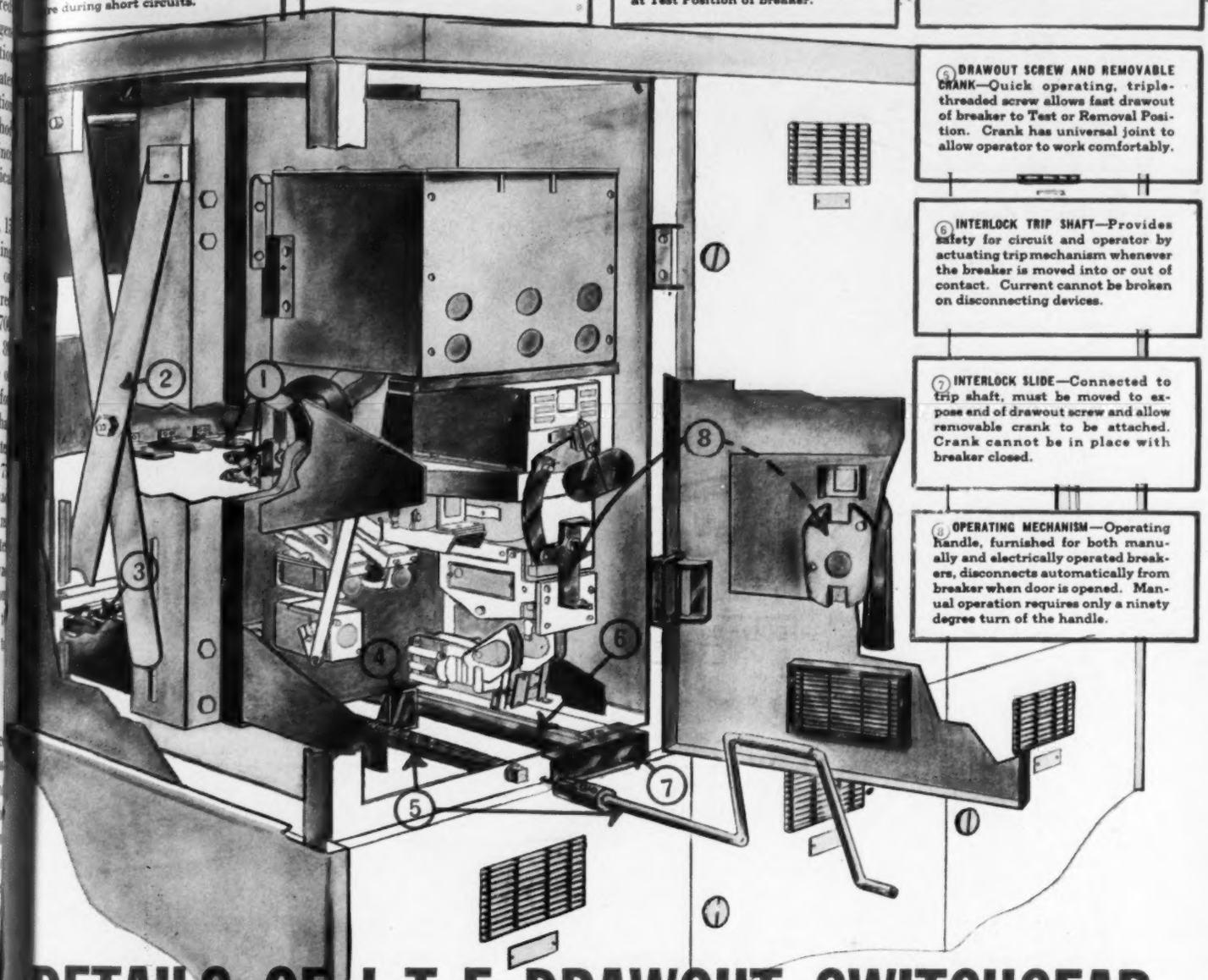
To conserve on materials in th tower installation second-hand pipin and valves were used both to an from the tower. It is to be particu larly noted that with the tower on th roof water returns to the genera

(1) PRIMARY DISCONNECTING DEVICES—Self-aligning fingers on removable element allow safe inspection away from live parts. Silver plated for freedom from overheating. Divided current path increases contact pressure during short circuits.

(2) PANTOGRAPH MECHANISM—A strong support for the circuit breaker, eliminates need for extension rails and saves time in removing breaker for servicing.

(3) SECONDARY DISCONNECTING DEVICES—For control relay, auxiliary switch and other small wiring circuits. Self-adjusting, silver plated. Flexible members mounted on removable element. Contacts closed at Test Position of breaker.

(4) POSITION INDICATORS—Breaker panel lines up with indicators when breaker is Closed/connected/or in Test Position. Protect breaker against being closed with disconnecting devices only in partial contact.



(5) DRAWOUT SCREW AND REMOVABLE CRANK—Quick operating, triple-threaded screw allows fast drawout of breaker to Test or Removal Position. Crank has universal joint to allow operator to work comfortably.

(6) INTERLOCK TRIP SHAFT—Provides safety for circuit and operator by actuating trip mechanism whenever the breaker is moved into or out of contact. Current cannot be broken on disconnecting devices.

(7) INTERLOCK SLIDE—Connected to trip shaft, must be moved to expose end of drawout screw and allow removable crank to be attached. Crank cannot be in place with breaker closed.

(8) OPERATING MECHANISM—Operating handle, furnished for both manually and electrically operated breakers, disconnects automatically from breaker when door is opened. Manual operation requires only a ninety degree turn of the handle.

DETAILS OF I-T-E DRAWOUT SWITCHGEAR ARE WELL WORTH YOUR STUDY

To know the details of Multumite drawout switchgear is to have in mind a measure for determining what you will one day want to specify--a useful guide when the time comes for new installation of completely metal-enclosed switchgear structures.

The advantages noted above are but a few of many. For a thorough description, have us send you Bulletin 4207 which plainly identifies and illustrates the features incorporated by I-T-E for safety and convenience in control and distribution of electric power.

I-T-E

AIR SWITCHGEAR

IMMERSED IN AIR • ENCASED IN STEEL

I-T-E

Representatives in Principal Cities

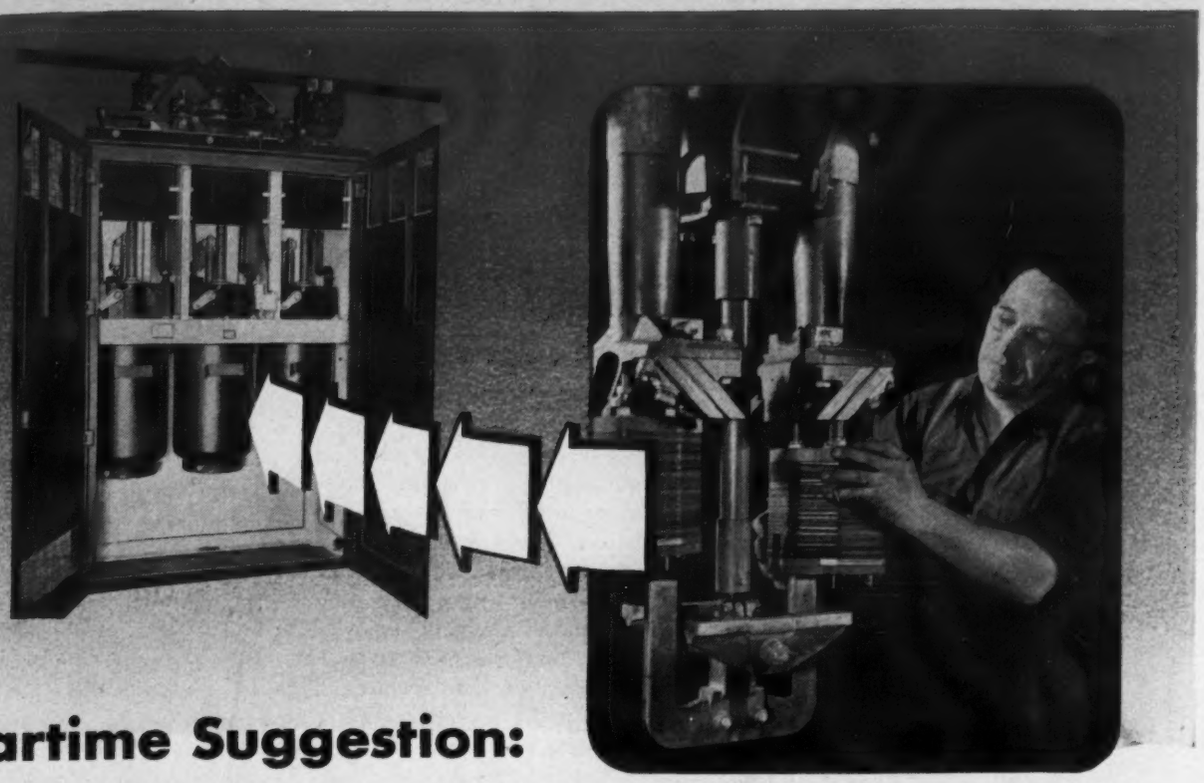
CIRCUIT BREAKER CO., PHILADELPHIA, PA.

READY TO TAKE ON 2500 KVA OF AMERICA'S INCREASING POWER DEMAND

IN MARCH, 1941, America's power output total 2,983,000,000 Kw-Hr. In March, 1943, it had increased to 3,947,000,000 Kw-Hr. Kuhlman Transformers have been playing an important role in helping to handle this increasing power demand.

The unit shown here (low voltage side of a 2500 KVA conservator type, single phase, 60 cycle, 6900 7200/12470 Y volts with 4—2½% taps) is typical of the many efficient transformers built by Kuhlman. Tap changers are brought out from the side of the tank. Temperature control for blower motors and wiring in conduit boxes. Blowers installed between radiators and structural steel construction throughout.

If you are interested in dependable, efficient transformers, it will pay you to get the facts about Kuhlman's.



A Wartime Suggestion:

When new breakers can't be bought . . .

ADD NEW LIFE TO OLD BREAKERS

with Westinghouse "De-ion Grids"

As system loads grow greater, breaker interrupting capacities must also be increased.

Where new breakers can't be obtained to meet such needs, a time and cost-saving solution in some cases, is to rebuild existing Westinghouse oil breakers to include modern "De-ion Grids".

For example, one Southern utility recently found it necessary to improve the performance of some of their indoor breakers to take care of war-expanded loads. New breakers were unobtainable. So they modernized the breakers with "De-ion Grids" . . . gave them a new lease on life. Their capacities were increased as a result of increased efficiency . . . critical materials were saved.

In addition, system stability was improved . . . faster arc extinction greatly reduced the need for breaker inspection and maintenance.

Investigate the possibilities of modernizing your present Westinghouse oil circuit breakers with "De-ion Grids". Westinghouse engineers will gladly consult with you . . . give you the benefit of their knowledge and experience. Write Westinghouse Electric & Manufacturing Company, East Pittsburgh, Pa., Dept. 7-N.

WHAT "DE-ION GRIDS" CAN DO

RENEW BREAKER LIFE. Add years of service.

INCREASE SYSTEM STABILITY. High-speed opening of the circuit shortens fault time; greatly reduces system disturbances.

REDUCE OIL DETERIORATION and contact burning. With faster arc extinction, you can increase periods between oil conditioning, contact inspection and dressing.

INCREASE BREAKER CAPACITY. Modern, quick-quenching "De-ion Grids" speed opening action, may permit handling heavier loads with greater safety. J-60538

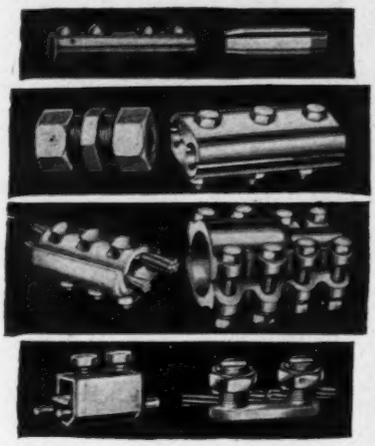
Westinghouse "De-ion Grids"

PLANTS IN 25 CITIES... OFFICES EVERYWHERE

"It sure is HANDY— to have ALL kinds in One Catalog!"

For any good Straight or Parallel Connector, *see the* **COMPLETE** *line*

These illustrations can only suggest the wide variety in the Penn-Union Catalog . . . a *complete* line of Bolted Straight Connectors and Reducers . . . Screw type . . . Split Sleeve type . . . Shrink fit . . . Universal Parallel Clamps . . . E-Z Connectors that take a wide range of conductor sizes.



Also . . . the most complete line of Service Connectors, Tee Connectors, Cable Taps . . . Elbow and Cross Connectors . . . Bus Supports, Clamps, Spacers . . . Grounding Clamps, Terminal Lugs.

Penn-Union connectors are the first choice of leading utilities, industrials, electrical manufacturers and contractors—because they have found that *"Penn-Union" on a fitting is their best guarantee of Dependability.*

PENN-UNION ELECTRIC CORPORATION
ERIE, PA. *Sold by Leading Jobbers*

PENN-UNION
Conductor Fittings

cooler by gravity, eliminating the need for pumps in the return line. This condition would not have obtained had the tower been installed at ground level.

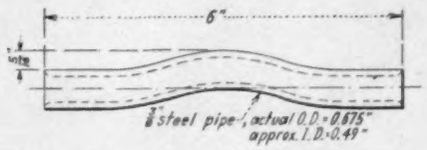
•

Used Armor Rod Salvaged for Reuse

By **SIDNEY TJEPKEMA**
Substation Maintenance Department,
Wisconsin Power & Light Co.,
Prairie du Sac, Wis.

An old trick used by electricians for many years to straighten wire and ductal material was adapted by the Wisconsin Power & Light Company recently to salvage 2,800 aluminum armor rods for reuse. The problem arose when the company was asked to remove a 266,000 cir.mil, 66-kv., aluminum circuit on wood fixtures. This wire was to be moved to the spare arms of steel towers serving the same interconnection.

All suspension supports were reinforced with ten tapered armor rods 62 in. long. These rods tapered from a diameter of 0.273 in. in the 27-in., straight center portion to 0.091 in. at the ends. From two to three wraps were made around the conductor with



SALVAGED aluminum armor rod can be straightened for reuse by drawing through offset pipe, chucked in lathe turning about 200 r.pm.

the straight part of the rod and a somewhat greater number on each tapered end.

To straighten the rods a $\frac{3}{8}$-in. black iron pipe was bent, as shown, and chucked in the head stock of a hollow lathe turning at about 200 r.p.m. The rod was gripped at approximately the middle and first one-half and then the other thrust into the pipe and drawn out, as the pipe turned in the lathe. Vise-grip pliers with copper-lined jaws was used to hold the rod. The pliers did not knick or damage the rod and were fast and easy to apply. It is advisable to use a small amount of lubricating oil at periodic intervals in the pipe.

About 7 in. of the tapered ends is not completely straightened by this process, but it was found very easy to straighten them with a leather m let and an anvil.

Two men can average about rods a day. Considerable time is sumed in separating the rods f each other because the linemen move all ten rods at once so that are practically in the same shape were in when on the line.

The same idea has been used different manner to salvage rods a No. 2/0 aluminum line. Ends these rods were not tapered, allow them to be chucked in a small tric drill. The pipe is held in a and the rod pushed through the other end can be chucked in drill and the rod pulled the rest of way through the pipe.

There are many adaptations of bent pipe for straightening ro ductile material. A bit of experim ing with it will often save time improve the appearance of a j Pipe with an internal diameter proximately twice that of the ro be straightened should be used. pipe should be bent to give an o ing through the pipe approxima the diameter of the rod.

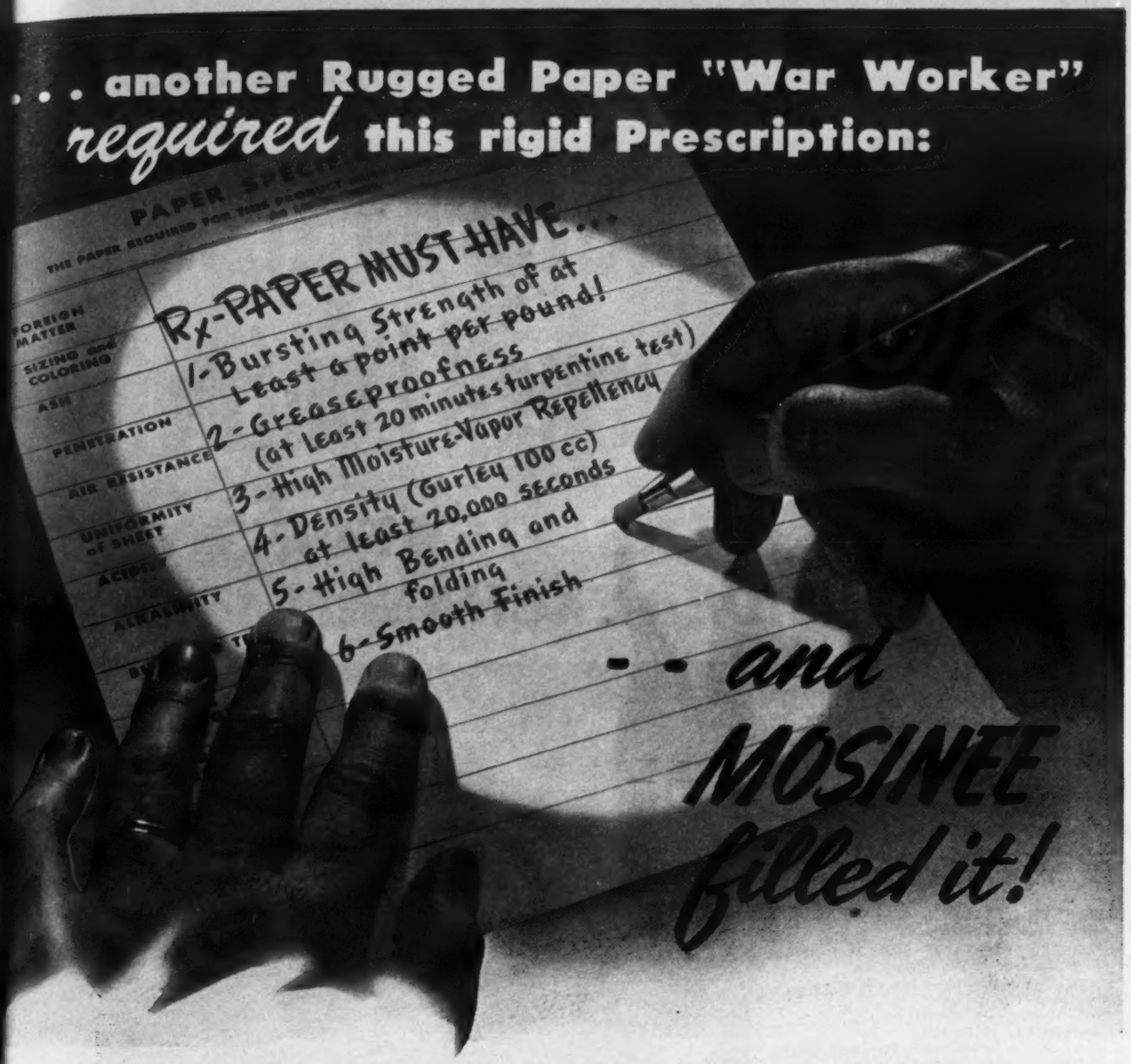
•

Banked Boiler Drums Filled With Steam

A novel but effective proced used at plants on the Southern I ana Gas & Electric System prev corrosion of boiler steam drums units that are to be banked d without load for appreciable peri Formerly the normal breathing such drums through their vents troduced moisture-laden air w tended to produce corrosion long periods of time.

To defeat this action the proce of plant operating engineers in ting down boilers even for one two-day periods is to connect boiler drum vents to the 2½ station exhaust steam header. T as the boiler cools, steam at low p sure instead of air is drawn into fills the drum, eliminating any dency to corrosion.

Use of an inert gas, such as ni gen, was considered for the purp but the cost of such a procedure m its use impracticable. The use low pressure steam has proved t ideal for the purpose and has used as a routine practice on all p of the system for several years.



Food must get to our armed forces in excellent condition. The containers must resist the ravages of all territories and changing conditions. The paper industry has expended great energy and capital to meet this problem. Mosinee technicians have made a contribution to this field by developing the product described above. This paper combines greaseproofness and high density and retains the basic strength of the sulphate fiber for improved bending, folding and scoring.

Our engineers are available to discuss this product with you and to help you solve problems which involve the use of paper in your processing.

Please address your letter "Attention Dept. B"

MOSINEE PAPER MILLS COMPANY
MOSINEE • WISCONSIN
Essential Paper Makers

ANOTHER EXAMPLE OF KELVINATOR'S RETAIL-MINDED ACTION IN WARTIME

New "Wartime Idea Exchange" Consumer Contact for

WINNERS IN KELVINATOR'S FIRST "WARTIME IDEA EXCHANGE" PROJECT

$1,000 in War Savings Bonds to These Top Names in Home Economics

SYBIL D. BATES—*Asst. State Supervisor* Emergency Farm Labor, 524 Post Office Bldg. Little Rock, Ark.

ELIZABETH D. BAYKIN—*Home Demonstration Agent*, Moncks Corner, S. C.

PHILOMENE BEGNAUD—*Home Demonstration Agent*, St. John Parish, Edgard, La.

GERTRUDE BERG—*Asst. Home Service Director* Milwaukee Gas & Light Co. 826 N. Cass, Milwaukee, Wisc.

CHRISTINE M. BERGIN—*Home Service Demonstrator*, Plymouth Electric & Water Utilities, Plymouth, Wisc.

MARGARET BILLINGSLEY—*County Home Demonstration Agent*, Safford, Ariz.

JANET L. CAMERON—*Food and Nutrition Specialist* Extension Service, Blacksburg, Va.

ESTELLE COOK—Windom, Minn.

DELLA L. CORDERY—*Consultant* Home Economics Dept., Public Service Electric & Gas Co., 80 Park Place, Newark, N. J.

MRS. DOROTHY W. COUSENS—*Homemaking Teacher*, Newton High School, Newton, Conn.

LURA OAKES CUSHMAN—*Miss Farmer's School of Cookery* 30 Huntington Avenue, Boston, Mass.

MARCELLA DICKINSON—*Home Economist* The Ohio Power Co., Van Wert, Ohio

ANN L. DILLARD—406 Cherokee Ave., S. E. Atlanta, Ga.

MARTHA E. DRESSLER—*Associate Professor* School of Home Economics, University of Washington, Seattle 5, Wash.

SHIRLEY FEGERT—Home Service Dept. The Gas Service Co., Wichita, Kansas

REGINA GABRIEL FRISBIE—*Asst. Director* Home Econ. Dept., Kellogg Co. Battle Creek, Mich.

MISS VENITA B. HARGIS—*Dir. of School Cafeterias, Evansville Public Schools* 200 N. W. Seventh St., Evansville, Ind.

MARY E. KELLEY—*Home Service Dept.* Gas Service Co., Wichita 1, Kansas

CHRISTINE KIESEL—*Home Econ. Teacher* Achille, Okla.

CORA E. KINGSBURY—Falls Village, Conn.

"Helps for Homemakers," Kelvinator's attractive new booklet, is 5½" x 8" in size, suitable for over-counter distribution or, when folded, for mailing.

MARGARET F. LEWIS—(*Winner of 2 Bonds*)—*Home Economics Extension Representative*, 23 West Ave., Wellsboro, Pa.

"ANN MARTIN"—*Supervisor Home Economics Unit*, Bureau of Power & Light Los Angeles, Calif.

LILLIAN B. McGILL—*Home Economist* The Twin State Gas & Electric Co. St. Johnsbury, Vermont

ANN McGOWAN—Southwestern Gas & Elec. Co. Marshall, Texas

MRS. MYRTLE NEGY—*County Home Dem. Agent* Grandbury, Texas

NELL B. NICHOLS—The Crowell-Collier Publishing Co., 250 Park Avenue, New York, N. Y.

MARY NIMS—*Home Economist* Public Service Co., Vinita, Okla.

NITA ORR—*Home Demonstration Agent* Erwin, Tenn.

HELEN M. PETERSEN—*Home Demonstration Agent*, Poplar Bluff, Mo.

EVELYN C. PYSZKA—*Home Service Adviser* Illinois Northern Utilities Co., Belvidere, Ill.

VELMA M. REIGLE—*County Home Extension Agent*, Box 569, Lexington, Nebr.

MARGARET M. RUDD—*H. M. Supervisor* F. S. A., Eddyville, Ky.

ARLINE SCHONERSTEDT—*Home Demonstration Agent*, Waller County, Hempstead, Texas

CLARA GEBHARD SNYDER—Wheat Flour Institute, Chicago, Ill.

MARY L. SUMMERS—*Home Demonstration Agent* 14A N. Meramec Ave., Clayton, Mo.

MISS NINA SWINDLER—U. T. Junior College Martin, Tenn.

ELIZABETH J. UMSTOT—39 W. Piedmont St., Keyser, W. Va.

HELEN VOLK—*Home Adviser, Extension Service* Office of Home Adviser, Grayslake, Ill.

GLADYS WASMUTH—111 Oglebay Hall, Morgantown, W. Va.

CONISTON E. ZELLER—Spirit Lake, Iowa

SCRAP IS POWER *Cooperate With Your Industry! Salvage All Inoperative Parts Containing Critical Materials . . . Put Vitally Needed Scrap Back Into The Scrap TODAY!*

Program Provides Monthly Kelvinator Retailers

EST IDEAS OF LEADING HOME ECONOMISTS ARE AVAILABLE MONTHLY TO NATION'S HOMEMAKERS THROUGH NEW KELVINATOR SERVICE BOOKLET, "HELPS FOR HOMEMAKERS"

he winners are in for this month's Kelvinator Wartime Idea Exchange" Project and the list cludes home economists from coast to coast. An ditor of a national women's magazine, a Home conomist of a famous school of cookery, Univer- y Home Economics Professors, County Home emonstration Agents, are among those to whom elvinator has awarded a total of $1,000 in War avings Bonds this month for their best ideas on Aids to Home Preservation of Fall Fruits and egetables."

These timely, practical ideas have been published in the first issue of "Helps for Homemakers." Jam- cked with helpful ideas for housewives, the ooklet is now available to Kelvinator retailers for stribution to consumers.

"Helps for Homemakers" is planned as a onthly service . . . a continuing point of contact between dealers and consumers, automatically building good will by filling a great need for information at a time when housewives are faced with the most trying homemaking problems of their lives. Printed in a 5½" x 8" size, it is ideal for over-counter distribution or, when folded, for mailing.

Next month's project, "Preparing Home and Family for Another Winter of War," has already been announced to Home Economists through the pages of "What's New in Home Economics," leading publication of the Home Economics profession.

Copies of the September issue of "Helps for Homemakers," with this month's 40 prize-winning ideas, are now available to all Kelvinator appliance retailers at nominal cost. We suggest that you contact your Kelvinator Distributor or Zone as soon as possible to obtain the quantity you will require.

(Availability of "Helps for Homemakers" booklets for consumer distribution is subject to any future Government paper conservation orders.)

LOOK AHEAD WITH KELVINATOR
DIVISION OF NASH-KELVINATOR CORPORATION
Kenosha · Milwaukee · DETROIT · Grand Rapids · Lansing

LOAD SERVICING

Industrial • Commercial • Rural • Residential

Civilian Aid Sought to Protect Lines

Electric power and telephone utilities in Massachusetts, tree wardens and the State College at Amherst have united in a program designed to enlist widespread civilian co-operation in preventing line service interruptions due to tree troubles. A 32-page bulletin (No. 397) prepared by Dr. Malcolm A. McKenzie of the college has been printed for general distribution covering tree protection in a comprehensive manner, and including sections on tree defects, the Dutch elm disease, treatment of tree wounds, illustrations of electric utility wire guards, insulators, and cable protectors. Newspaper advertisements and bill stuffers have been published urging utility customers to watch and protect their trees, emphasizing the importance of continuous electric service to the war effort and to public safety.

The public has been invited to write to Massachusetts State College for the above information, the bill stuffers being 3¼ x 6-in. cards asking the public to report any observed defective tree conditions to local tree wardens for action. In case such defects are brought to the wardens' attention, they are remedied by the local warden and his staff, or with the aid of the utility company in instances requiring more extended service.

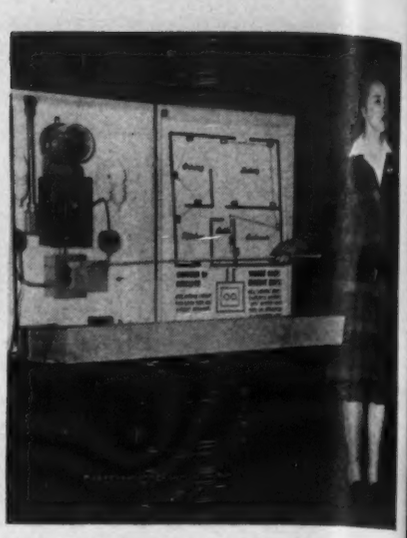
Local representatives of utilities have been named members of committees to co-operate with the wardens. The Massachusetts Tree Wardens and Foresters Association is co-operating to the full in this work, which is being furthered by Boston Edison, New England Power, Lynn Gas & Electric, Western Massachusetts Electric, New England Gas & Electric, members of the Massachusetts Municipal Lighting Association group, New England Telephone & Telegraph, and Brockton Edison among the utilities, and the State Department of Public Works.

•

Proves Value of Repair Clinics

By J. ELLIS BRIGGS,
Central Hudson Gas & Electric Corporation, Poughkeepsie, N. Y.

Nearly 10,000 people learned how to take better care of their electric appliances and to make simple repairs on them at 84 appliance repair clinics conducted by the Central Hudson Gas & Electric Corporation in the period January-May, inclusive, this year. Average attendance at the clinics was 115. At the clinics 115 cords and 116 lamps and appliances were repaired by the customers themselves under the direction of utility personnel and in addition 25 repair jobs were referred to the utility shop and 49 to dealers.



DEMONSTRATION of how electricity enters and is used in the home

Clinics were of two types, one arranged for women's clubs, granges, church groups, etc., and the other for schools. Publicity for the adult meetings consisted of posters, postcard invitations, local newspaper advertising and news items and, most effective, display for about ten days ahead of very worthwhile door prizes—an electric tea kettle, oven, water heater or cooker, depending on the estimated size of the meeting. At the school clinics, which were arranged with local school authorities and which were welcomed by teachers for their educational value, the prizes were awarded, not by drawing, but for the most intelligent questions asked by pupils.

Both adult and school meetings were opened with a showing of the movie "Captain in the Kitchen," followed by a demonstration, as shown in one of the accompanying pictures, of how electricity is brought into and distributed around the home. Then came a question period, which, in the school meeting, was set up in imitation of the radio program "Information Please," with two members of the school faculty and two utility people as "experts" on the platform. Appliances brought in for repair were

Watch and Protect Your Trees
Healthy trees should be highly prized by all communities, but seriously weakened trees may be DANGEROUS LIABILITIES.
EXTRA CARE AND CEASELESS WATCHING ARE IMPERATIVE TO KEEP ALL TREES IN GOOD CONDITION
The cooperation of every person is requested by the Massachusetts Tree Wardens' and Foresters' Association, to report any defective tree to the nearest Tree Warden. There is a Warden or Forester in every city or town. Call your city or town hall for his name and telephone number. Please notify him immediately whenever you observe a tree in bad condition.
SIGN and MAIL THIS CARD FOR FREE BULLETIN No. 397 . . "A Civilian Program for Tree Protection."
A PEACE-TIME ACCIDENT becomes A WAR-TIME TRAGEDY
A tree or limb which falls can injure pedestrians, delay transportation of troops or war materials, or disrupt electric light, telephone, fire alarm and telegraph service.

BILL STUFFER featuring importance of civilian co-operation with Massachusetts tree wardens and utilities in maintaining continuous overhead line service

ary's at work today because of an RCA Electron Tube

ESTERDAY she sat at a machine, feeding wires into a press that formed [wire] into their required size and shape. Her hands moved swiftly, automatically, [close] to the dies in that press.

Then suddenly it happened. She heard her name called, turned her head, the dies [came] down—*and then stopped.*

It was no miracle. It was simply *the Magic Brain of an RCA Electron Tube* that "saw" what was about to happen and froze the press instantly.

Today Mary's on the job—instead of in a hospital. All because of an RCA Electron Tube.

• • •

RCA is at present supplying government—and industry—with a variety of electron tubes. Not for tomorrow's world, but for today. In our own factory, electron tubes are operating not only photo-electric safety devices but instruments that detect microscopic flaws in wires, measure and record spectral energy, match colors, measure wire diameters with an accuracy of one ten-thousandth of an inch.

It may be that we can supply your engineers with information on tubes that will let them design equipment to do some required job faster, better, cheaper, or more safely than you are now doing it. If it can be done the electronic way, chances are RCA has the tubes to do it. For, just as the magic brain of all electronic equipment is a tube, so the fountain-head of modern tube development is RCA.

Write Room 438 at address below for illustrated booklet *Electrons in Action at RCA.*

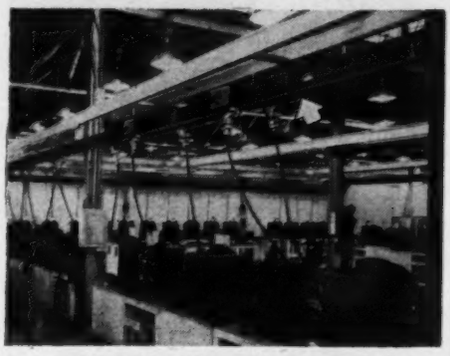
A curtain of light, reflecting across the front of the machine and returned to the Phototube by means of two mirrors, automatically—if interrupted—locks the controls of the machine in safe "off" position.

RCA

RCA ELECTRON TUBES

Tube and Equipment Department, RCA Victor Division, Radio Corporation of America, Camden, N. J.

7 PLUSES IN NEW LO-X *Ventilated* FEEDER DUCT



+ Increased current-carrying capacity
+ Lower operating temperatures
+ Lessened voltage drop
+ Lighter weight
+ Maximum saving in critical materials
+ Improved appearance
+ Easier maintenance and inspection

Flexible Light and Power

Built in standard, interchangeable 10-foot sections, BullDog BUStribution DUCT provides *complete flexibility* on branch power and lighting circuits. The plug-in feature enables you to change production machines at will—rearrange whole departments without interrupting production elsewhere.

BUStribution DUCT is quickly and easily installed—makes sensational savings in maintenance.

Capacities available for Plug-in Type Duct under new WPB standards are 250A, 400A and 600A.

PLUG-IN TYPE for Branch Circuits

(Left) End view of branch circuit plug mounted on a bus duct section—showing how copper "contact fingers" clamp over the busbars in the duct. Plugs are readily interchangeable. Capacities: 30A to 600A; 600 Volts or less.

CONFORMS TO WPB LIMITATION ORDER L-273

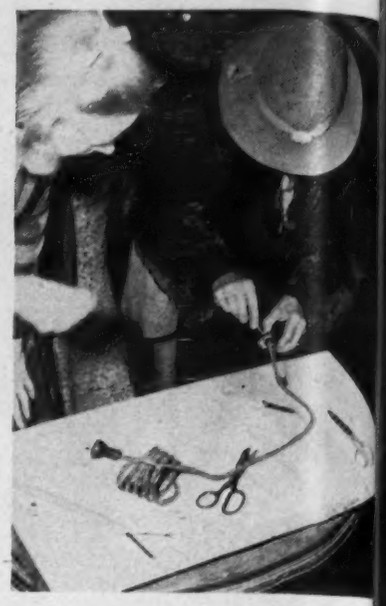
Ventilated type LO-X Duct for Feeder runs also shares all the basic advantages of BullDog's famous BUStribution DUCT design. It is quickly and easily installed—has full asset value—is 100% salvable. Available in the new WPB ratings of 800A, 1000A, 1350A, 1600A and 2000A. Single-phase, 3-phase, and 3-phase 4-wire; 600 Volts or less.

BULLDOG
ELECTRIC PRODUCTS CO.
DETROIT, MICHIGAN
BullDog Electric Products of Canada, Ltd.
Toronto, Ontario
Branch Offices in Principal Cities

MANUFACTURERS OF a complete line of Vacu-Break Safety Switches, Panelboards, Switchboards, Circuit Master Breakers and BUStribution SYSTEMS.

To help win the war, SAVE metals—SAVE fats—SAVE money, BY BUYING WAR BONDS

then called for and the meeting ... ally broke up into small group... around members of the audience ... pairing their own appliances as ... pears in the picture. It is interesti...



CUSTOMERS do their own repairs

to note in the picture that the tool... used are those to hand in any home... The final event of the meeting wa... the awarding of prizes, one or more... as the size of the meeting would deter... mine.

•

St. Louis Helps the Specialty Dealer

The situation of electrical dealer... who sold *only* electrical appliances ... vastly different in St. Louis today... from what it was nine months ago... Thanks to the efforts of the dealers... themselves, guided and advised by the... Union Electric Company of Missouri... 84 percent are still in business, and... barring the unforeseen most of them... should be able to remain active for... the duration.

When the war emergency arose... there were 25 retailers in St. Louis... who stocked and sold only electrical... appliances. Now there are only three... Only four, however, have gone out of... business. The 18 others are now sell... ing furniture, housewares and dry... goods along with whatever electrical... merchandise they have.

This situation is in part, at least... due to the work done among these... dealers based on the conviction of... Union Electric executives that the...

This generator armature has been "Harvelized" by Hanson-Van Winkle-Munning Company. They use Harvel varnish because – (1) bakes quicker – (2) bakes harder – (3) does not become brittle – (4) lasts longer.

THE SECRET OF BETTER INSULATION in a NUTSHELL

FROM the shell structure of the familiar Cashew nut comes a natural phenol which is the basic component of Harvel Insulating Varnishes. The discovery of this unique insulating ingredient which has been utilized by Irvington in the manufacture of a superior insulating varnish is the result of exhaustive research and an experience of over thirty-six years in making all types of insulating varnishes.

Harvel varnishes have many excellent insulating properties which add years to the life of motors, generators, transformers and other electrical equipment. They possess the highest safety factors even when operating under excessive heat, heavy over-loads and in atmospheres where acid or alkali fumes and abrasive materials are present. For example:

Motor failures in a large chemical plant occurred every three months until Harvel varnish was used. Now, three years of uninterrupted service on these same motors is not unusual. This is typical of Harvel performance under extreme conditions.

Harvel reduces the time necessary to produce a unit of electrical equipment by cutting the average baking time in half on applications involving multiple coats. It polymerizes to a solid infusible state and will not soften or "throw-out" at high peripheral speeds.

Harvel varnishes have excellent dip-tank stability—exceptional penetrating power—and contain no objectionable solvents.

Because the unusual features of Harvel varnishes are not all disclosed by ordinary laboratory methods of testing, why not get these facts first-hand? We will gladly send you a generous sample for testing. See for yourself how Harvel varnishes are superior for use with any type of insulation for application on equipment wound with enameled Formex and Formvar coated wire, Fiberglas, Cotton, Asbestos and paper or enameled wire of all classes.

For catalog, samples, or for technical assistance on unusual problems, write Dept. 46.

Irvington
VARNISH & INSULATOR CO.
IRVINGTON, NEW JERSEY, U. S. A.

PLANTS AT IRVINGTON, N. J. & HAMILTON, ONT., CAN. • *Representatives in 20 Principal Cities*

THESE PARAGONS OF PERFORMANCE

Speed output

They save precious man-hours . . . step up human efficiency . . . aid mightily in reaching those high-production goals.

Paragon Automatic Timers are being used in thousands of industrial operations . . . such as: Watchman signals, power disconnect, conveyor operation, pump operation, light exposure, liquid agitation, enamel baking, heat treating, rubber curing, plastic molding, etc.

Ask a Paragon Timer Engineer to help plan your present or post-war equipment. No charge; no obligation.

WRITE FOR THIS BOOK

. . . Describing industrial timers, time-switches and other time controls. Contains illustraticns, construction and installation data, list prices and reference information.

* Manually reset interval timer 4⅜" high, 2½" wide, 1⅞" deep, for surface mounting on standard handy box.

PARAGON ELECTRIC COMPANY
407 S. Dearborn St. • Chicago, Illinois

Paragon Chicago
BUILDERS OF ELECTRICAL EQUIPMENT SINCE 1905

and the utility industry generally, owed an obligation to specialty dealers for the part that the electrical industry had played in urging the expansion of their specialty stores during the past ten years of close cooperation and market development.

Because of this conviction, when electrical appliance dealers began to find that they couldn't replace equipment as fast as it was being sold, the Union Electric Company "pitched in" with advice and assistance. Assistance that was given was entirely advisory, but every effort was made to help individual dealers find an answer to their problems. The operations of each specialty dealer were analyzed individually as to types of merchandise, present electrical lines, capital, size of store, ability to add space, size of organization, adaptability, potential community buying power and competition.

Additional Lines

On the basis of the findings a few of the dealers were advised to close down, but the bulk of them were advised to take on additional non-electrical lines and in some instances expand their store facilities and organization to tide them over the present period of appliance scarcity. The fact that 21 of the original 25 specialty dealers are still in business 18 months after Pearl Harbor is proof of the soundness of this advice.

Nor have the company dealer cooperative activities been confined solely to specialty dealers. There are 412 retail appliance outlets in St. Louis. Of these a year ago 212 were doing servicing themselves or accepting broken appliances for repair by other dealers who service appliances. A recent survey shows that only 30 dealers in this group have closed their doors and 12, while still in business, have stopped servicing appliances. Reasons given were: (1) Business owner has joined the armed services; (2) business owner has gone to work in a war plant, or (3) it has been impossible to secure parts or servicing help or both. Of the 30 dealers who have closed their doors 24 were servicing companies selling no appliances and six were dealers operating in furniture, hardware and electric appliances.

To help reduce the mortality rate among these servicing dealers Union Electric has assembled data on (1) available stocks of repair parts on

by dipping, spraying or brushing for effective control of decay, "shell rot" or attack by termites or powder post beetles. Also use it on new poles to insure longer service life.

PERMATOX *A* is easy to handle and inexpensive to apply. Available as *economical concentrates* (1 to 10, also 1 to 5) to save freight and cargo space on shipments to foreign utilities.

Furnished in Two Forms:

DOWICIDE 7
Pentachlorphenol* crystals

PERMATOX A
5% Pentachlorphenol* in suitable petroleum solvents

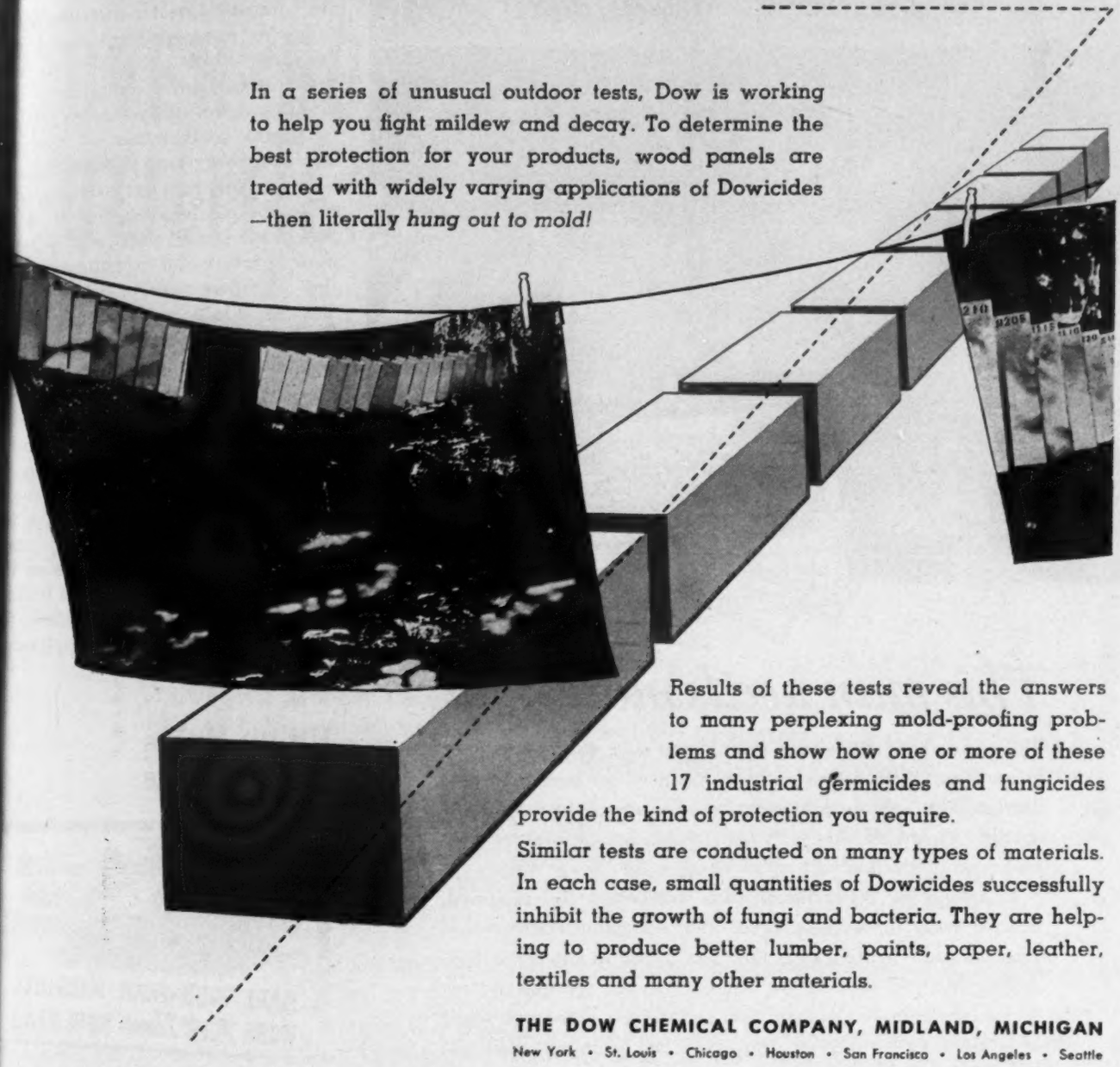
*Manufactured by Dow Chemical Company

Write for Bulletin

A. D. CHAPMAN & COMPANY, INC.
333 N. MICHIGAN AVE. CHICAGO
Memphis • New Orleans
New York • Portland

Hung Out to Mold—
a Test for Your Products' Protection

In a series of unusual outdoor tests, Dow is working to help you fight mildew and decay. To determine the best protection for your products, wood panels are treated with widely varying applications of Dowicides —then literally *hung out to mold!*



Results of these tests reveal the answers to many perplexing mold-proofing problems and show how one or more of these 17 industrial germicides and fungicides provide the kind of protection you require.

Similar tests are conducted on many types of materials. In each case, small quantities of Dowicides successfully inhibit the growth of fungi and bacteria. They are helping to produce better lumber, paints, paper, leather, textiles and many other materials.

THE DOW CHEMICAL COMPANY, MIDLAND, MICHIGAN

New York • St. Louis • Chicago • Houston • San Francisco • Los Angeles • Seattle

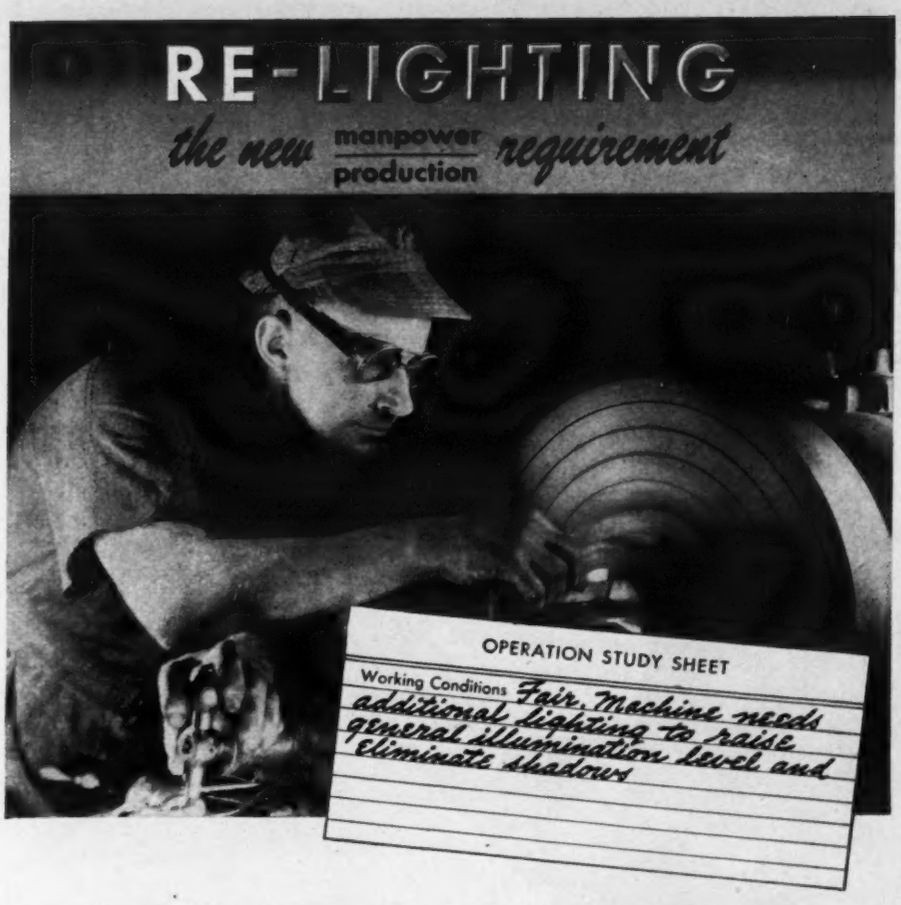
DOWICIDE'S USE IN POWER TRANSMISSION AND COMMUNICATIONS—Poles and other timbers for outdoor use produce longer service and require less maintenance when impregnated with Dowicide. Oil soluble Dowicide 7 and water soluble Dowicide G are both used for this purpose. Either is simple to use leaving the wood odorless, free of discoloration, completely paintable and efficiently protected from decay and termites.

DOWICIDE

GERMICIDES AND FUNGICIDES

DOW

CHEMICALS INDISPENSABLE TO INDUSTRY AND VICTORY


RE-LIGHTING
the new manpower production requirement
OPERATION STUDY SHEET
Working Conditions Fair. Machine needs additional lighting to raise general illumination level and eliminate shadows

This man needs more light

The plant where this worker is employed—like most plants built before Pearl Harbor—was probably designed for peacetime production, with lighting equipment intended merely to supplement daylight. Hence, *its lighting system is inadequate for wartime night work*—and production falls off seriously on the "swing shifts."

Re-lighting for better illumination will correct this condition, make it easier for workers to see—thus increasing efficiency and production. Re-lighting costs little and is easy to arrange. A Silv-A-King lighting engineer, for instance, can tell you quickly how to re-locate lamps to eliminate glare and shadow...show you where it is necessary to increase lamp wattages or install additional equipment to insure uniform high lighting levels.

Silv-A-King fluorescent equipment, with reflectors of non-critical Silv-A-Tex, is available for prompt delivery to war plants. Silv-A-King equipment (fluorescent or incandescent), plus a Silv-A-King "engineered layout" make an unbeatable combination.

BRIGHT LIGHT REFLECTOR COMPANY, INC.
1035 Metropolitan Avenue, Brooklyn 2, N. Y.

Send for new Folder 43-V describing Silv-A-King "Victory" Fluorescent Units.

SILV-A-KING MAKES *Light* WORK FOR YOU

dealers' shelves, (2) manpower for servicing, (3) delivery facilities and (4) shop equipment for servicing.

These data have been used by the company's dealer merchandising counselor in appealing to local gasoline rationing boards for consideration of justification and desirability for granting sufficient gasoline to dealers to insure continuation of essential services. Everything possible that can be done under the circumstances, such as exchanges between dealers, location of hard-to-get parts, etc., is being done to insure and expedite a smooth flow of repair parts to dealer organizations. Plans are currently being considered for training servicemen in public schools, vocational divisions and trade schools.

Continuation of the war and further drains on servicing manpower might see further casualties among St. Louis dealers; however, in the face of a co-ordinated industry effort in the area observers are reasonably certain that St. Louis will emerge from the war period without having to build a complete and new dealer structure for the promotion and sale of appliances.

•

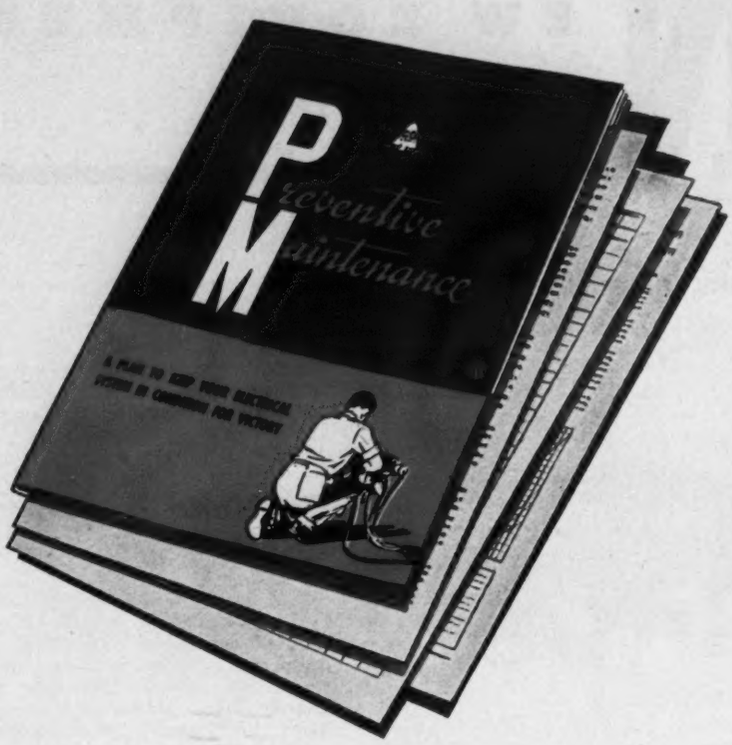
Utility Helps the Harvests

MAKE YOUR FARM MACHINES WORK *Full Time* THIS YEAR
MAKE your farm machinery put in full time this year — and "overtime," too. Let your labor-saving devices do as much work as they possibly can to help offset the manpower shortage.
This advertisement published by the Agricultural Division of the Georgia Power Company, cooperating with the Georgia Agricultural Extension Service

One of a series of newspaper advertisements by which Georgia Power Company is promoting the cause of agricultural production. Other ads have dealt with volunteer work on farms, maintenance of farm equipment, processing of produce, etc.

OVER 50 UTILITIES

using PM plan to help power customers avoid Electrical Breakdowns



Introduced a short time ago, Anaconda's Preventive Maintenance Plan is being widely used by utilities to help customers keep electrical systems operating *efficiently*—despite shortages in essential wiring equipment.

Already some 50 utilities are actively engaged in this program. With it, they are helping their industrial power customers maintain continuous wartime production by preventing electrical breakdowns.

WHAT THE PLAN IS

The PM plan is a simple but comprehensive way to safeguard war production by preventing electrical breakdowns *before they develop.*

HOW IT WORKS

The plan provides a practical means of making periodic, systematic analysis of circuits and equipment. Uncovers potential weaknesses . . . suggests ways to correct them . . . prevents overloading of lines.

Data thus gathered aids local W.P.B. Branches in reaching decisions on requests for materials to *prevent* breakdowns.

HOW UTILITIES BENEFIT

The PM plan helps utilities maintain close customer contact despite a lack of "something to sell." Offers basis for service campaign that definitely appeals to customers. Puts the utility in a leadership role for furthering war production throughout the area it serves.

If you aren't already utilizing the Anaconda Preventive Maintenance Plan, mail the coupon for full details.

43227

"Tomorrow may be too late . . . do it today!"

ANACONDA'S PREVENTIVE MAINTENANCE PLAN

Anaconda Wire & Cable Company
25 Broadway, New York City 4

Please send copy of the Anaconda Preventive Maintenance Plan for safeguarding wartime production.

Individual .....

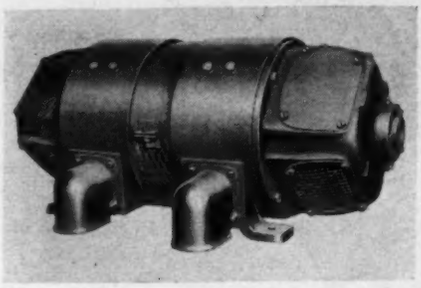
Company .....

Address ..... City .....

NEW EQUIPMENT

Motor-generator

A new line of two-bearing (ball) motor-alternator sets has been designed for converting direct current to alternating current. Constant a.c. voltage is said to be maintained by an alternator series field which is in series with the motor armature. Fields of the motor and alternator are stationary and the armature windings are rotating members mounted on a common solid shaft. The rotating unit may be pulled out of the stator by removing an end shield.

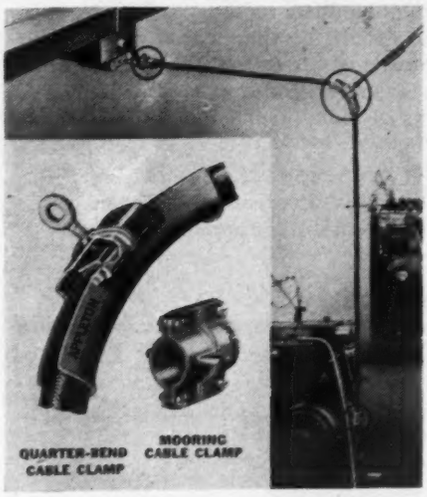


Two-bearing motor-alternator sets; integral ratings up to 5 kva., single phase, 3,600 r.p.m. (illustrated, drippproof construction, common fan for ventilation). **General Electric Co.**, Schenectady, N. Y.

•

Cable Clamps

For exposed industrial wiring cable clamps of malleable iron have been developed to provide a suitable support for branch feeders from the main distribution system. According to the manufacturer the quarter-bend clamp provides the proper bending radius without injury to the cable and the mooring clamp is used to anchor cable at supply and output ends without undue strain on cable line.



"Quarter-bend" and "Mooring" cable clamps; four sizes of each, take cable sizes up to ⅝, ⅞, 1 and 15/16 in. diameter. **Appleton Electric Co.**, 1701 Wellington Ave., Chicago, Ill.

•

Gas Mask

"Protexall" gas mask. **American-LaFrance-Foamite Corp.**, Elmira, N. Y.

New gas mask has facepiece of molded rubber with large contoured lenses of shatter-proof safety glass. Dry, incoming air passes over lenses to prevent fogging. Exhalation valve is protected by metal guard. Timer indicates length of time mask can be safely used. Canister gives approximately two hours service; contains chemicals and a filter for toxic smoke, dust, mists and fumes. The mask has approval of the U. S. Bureau of Mines.

•

Induction Heater

"Tocco Junior" induction heating machine; output 15 kw., 9,600 cycles. **Ohio Crankshaft Co.**, Cleveland 1, Ohio.

New unit added to the company's line of induction heaters occupies 48x32 in. of floor space and stands 51 in. high with the work pan set 35 in. above the floor. Power is furnished by a 20-hp. motor-generator set. Only three connections are needed—two for water and one for power, 220/440 volts. The unit offers pre-set automatic controls and it can be run by women operators.

•

Lighting Unit

Model "No. 2060" fluorescent lighting unit; uses two 20-watt lamps; for operation on 110-125 volt, 60-cycle circuits. Dimensions, 4½ in. high, 24 in. long, 9½ in. wide. **Mitchell Manufacturing Co.**, 2525 N. Clybourn, Chicago, Ill.

An all-purpose industrial unit has reflector made of "Lumenite" and is furnished with ballast, sockets, FS-2 starters and 6-ft. cord and plug. It is available for rigid (conduit), chain or continuous row mounting. Knockouts are provided at both ends.

BUYING ELECTRICAL EQUIPMENT?—McGraw-Hill's *Electrical Buyers Reference* is a convenient place to look first for manufacturers' product data, names and addresses.

Temperature Control

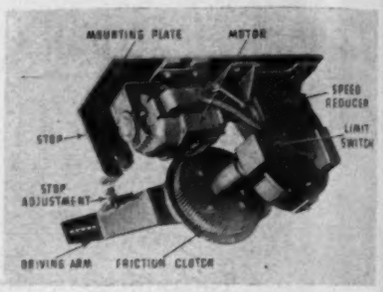
"Furnatron" electronic temperature control system. **Westinghouse Electric & Mfg. Co.**, East Pittsburgh, Pa.

A control system has been developed to keep variations of single- or three-phase resistance furnace temperatures to a minimum. The system has a thermocouple type of temperature controller with automatic electronic control of the saturation current of a saturable reactor connected in the supply line of the furnace elements, thus automatically controlling the power input into the furnace. A droop corrector can be included to compensate for heat exchange due to fluctuations in the rate at which the furnace is being loaded. The regulator is arranged for flush panel mounting.

•

Door Operator

Electric operator unit includes motor, speed reducer, friction clutch, limit switch, relay and control switch. With model V, operator control switch must be held closed during door operation. Model VR operator requires only a momentary contact for control. If door is stalled, clutch will slip only until drive shaft reaches the end of its normal stroke, then limit switch stops the motor in the usual manner.



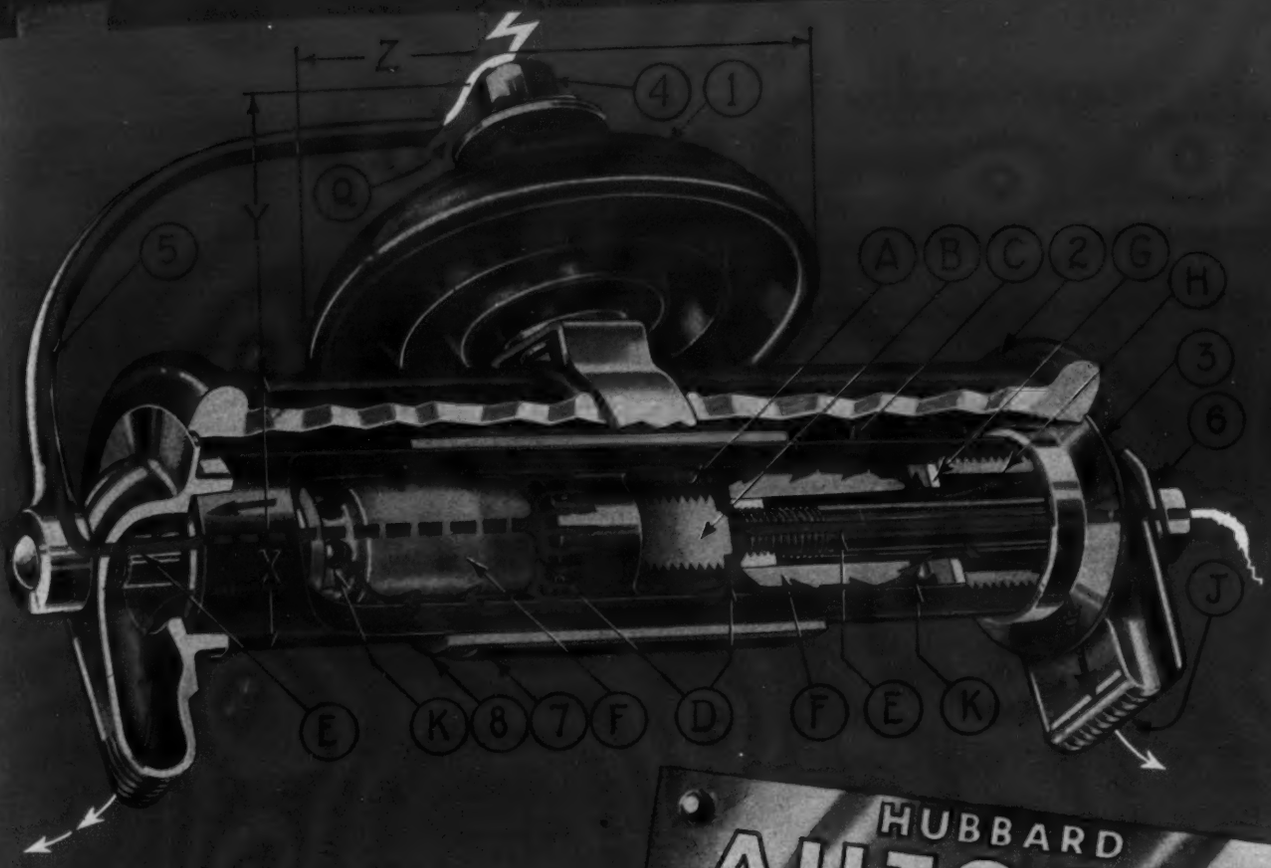
Models "V" and "VR" door operators; for one-, two-, three- and four-leaf inward swinging doors and one leaf outward swinging doors; motors operate on standard commercial voltages and frequencies. **Barber-Colman Co.**, Rockford, Ill.

•

Blower

Compact blower has a one-piece housing of molded high impact plastic. Turbo type wheel is 1½ in. in diameter, made of steel and cadmium plated. A back plate facilitates mounting the blower on any type motor.

Model "No. 1½" plastic blower; capacity 15 c.f.m. at 3,000 r.p.m. Weight of wheel and housing 2 oz. **L-R Manufacturing Co.**, Torrington, Conn.



1. Wet Process Porc. Ins.
2. Wet Process Porc. Tube
3. Exhaust Shield
4. Line Terminal
5. Arc Horn
6. Ground Terminal
7. Steel Sleeve
8. Fibre Sleeve
A. Composite Fibre Barrier
B. Threaded Core
C. Fibre Tube
D. Electrodes
E. Stud
F. Fibre Exhaust Sleeve
G. Washer
H. Threaded Sleeve
J. Exhaust Vents
K. Exhaust Ports
O. External Gap

HUBBARD AUTOGAP LIGHTNING ARRESTERS

The path of a lightning discharge through a Hubbard Autogap Arrester is shown by the heavy red line, solid and broken. Arrows show the course of exhaust gases after the arc is blown apart. Although, for sake of clarity, the illustration shows numerous "streamers" encircling the barrier "B", this is not necessarily true to fact, since the path MAY be single for each operation but through many operations, will seek a multitude of DIFFERENT paths.

---

1 The Autogap Barrier "B" offers a cylindrical gap of fibre between electrodes "D". In operation, the path of lightning discharge is over any part of the surface of this cylindrical barrier. THERE IS NO "BEATEN PATH"!

2 Due to the gap "Q" the barrier "B" is not in a leakage path to ground, therefore not subject to CONTINUAL burning by leakage currents. This feature also provides Hubbard Autogaps with a long life of service. AUTOGAPS OPERATE ONLY WHEN NEEDED.

3 The "explosion" resulting from operation under excessive voltage is exhausted in two opposite directions from the barrier with ample freedom of passage to the open air. One more point providing longevity of service without interruption or MAINTENANCE.

4 Installation may be made on crossarm, pole or transformer and all three types may be easily covered with rubber blankets. Unexposed line connection styles may be obtained if desired.

5 Made in several styles, various capacities and with mountings for any circuit, all styles operating on the same principle.

Make a note of these Features—

HUBBARD

UBBARD AND COMPANY

BURGH OAKLAND CALIFORNIA CHICAGO

Sound your 'A'

We're going to "tune" a 400 cycle meter

Pitch pipes or ordinary tuning-forks are good enough for *musical* instruments where human error is expected —but not for *electrical* instruments. Tuning-fork electronic oscillators of our own design are used to calibrate J-B-T Vibrating Reed Frequency Meters because this is the most scientific, most accurate method we know of. Reeds are calibrated *twice*—once before assembly and later in the completed instrument. Before shipment each instrument is given a *final* check for accuracy of resonance.

Equally important to you is the J-B-T practice of "engineering" the *instrument* to fit the *job*. Take the new 400 cycle meter at the right. To obtain full reed amplitude *with* low power consumption at 400 cycles, special design and construction are required. For example, the reed mounts are considerably longer than in models for lower frequencies, and both driving coil and permanent magnets are mounted near the free ends of the reeds.

The new 400 cycle meter, like all other J-B-T Vibrating Reed Frequency Meters, requires no adjustment while in service, even under adverse vibration conditions. It is not affected by wave form, normal temperature changes or external magnetic fields. Simply READ the REED and that's your frequency.

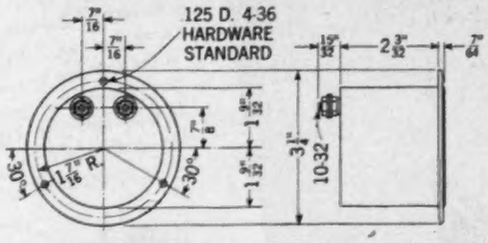
For full description of the complete line of J-B-T Vibrating Reed Frequency Meters, send for Bulletin VF-43.

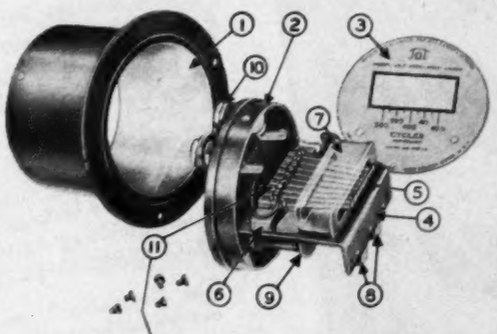
MODEL 33-F *for 400 Cycles*

Size . . . 3¼" flange diameter. Black metal* case for flush panel mounting. Single window type . 9 to 11 reeds.** Five or ten cycle increments. Accuracy . . . 0.3% under normal operating temperatures. Minimum voltage . . . 100. Power consumption . . . 1.75 watts. Ohms per volt . . .70.— at 400 cycles.

*Molded 3½" case to meet ASA specifications C39.2-1943 for mounting will be available shortly.

**9-reed instruments for 380-420 cycles in production; other ranges and reed groupings available on special order.





1. Case
2. Base
3. Dial
4. Central Mounting Frame
5. Spring Steel Reeds
6. Reed Mounting Bar
7. Driving Coil
8. Permanent Magnets
9. Series Resistor
10. Terminal Studs
11. Long Reed Mount

(Reed and reed mount from 60 cycle instrument—for comparison)

(Manufactured under Triplett Patents and/or Patents Pending)

J-B-T

J-B-T INSTRUMENTS, INC.

439 CHAPEL STREET • NEW HAVEN 8, CONNECTICUT

9-JBT-3

TECHNICAL LITERATURE

ELECTRIC CORDS—"How to Make Your Electric Cords Last Longer" outlines instructions for care of cords and plugs ordinarily used in the home. The pamphlet issued by Bureau of Human Nutrition and Home Economics, U. S. Department of Agriculture, can be ordered from Superintendent of Documents, Washington, D. C., price 5 cents per copy; $1 per 100 copies.

ELECTRONICS—Fundamental principles of the six basic ways (rectify, amplify, generate, control, transform light into current and current into light) in which electronic tubes function, schematic drawings of tube construction and diagrams showing typical circuits, are contained in booklet B-3260, "The ABC of Electronics At Work," available from Dept. 7-N-20, Westinghouse Electric & Manufacturing Co., East Pittsburgh, Pa.

LIFTING MAGNETS—Thirteen suggestions in simple, clear language with graphic pictures on just what to do and what not to do are given on a 8x20-in. card "How to Make Magnets Lift More, Work Faster and Last Longer." The card can be obtained from Cutler-Hammer, Inc., 235 North 12th St., Milwaukee, Wis.

TELEPHONES—Useful and specific tips on maintenance of telephone equipment is contained in a 12-page booklet "75 Ways for Telephone Folks to Help Win the War." Copies of the illustrated booklet are obtainable from Kellogg Switchboard & Supply Co., 6650 South Cicero Ave., Chicago, Ill.

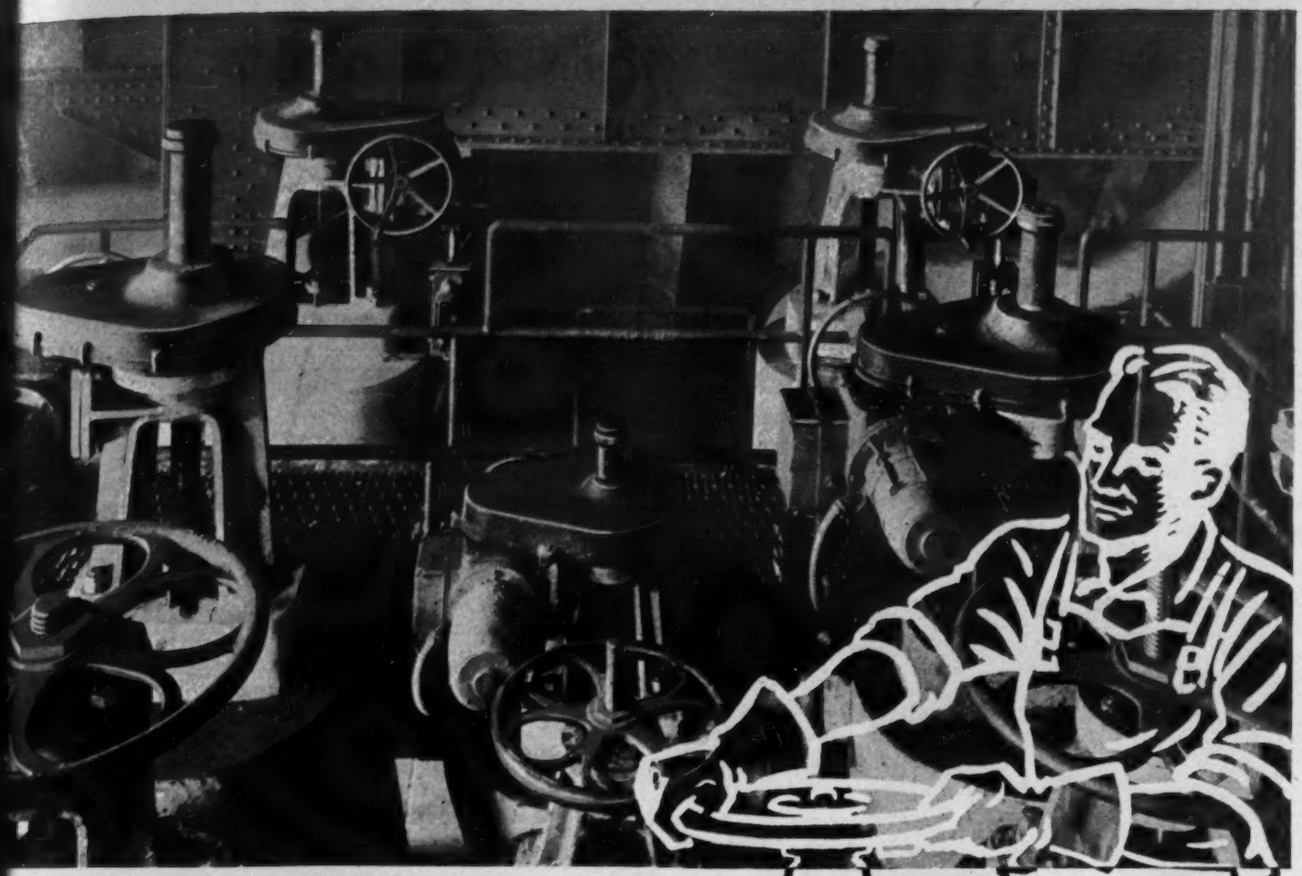
PIPING — Maximum allowable working pressures for seamless steel pipe for power and district heating, for gas and air, for oil—inside and outside refineries, also various ways in which piping can be used, are presented in a booklet obtainable from Department C-7, Flori Pipe Co., St. Louis, Mo.

OIL—A chart for oil separator selection and a discussion on the importance of selecting engine oil not alone for its lubricating properties but also for its subsequent removal facility is presented in a publication No. 24, "Separating Oil From Steam," which is obtainable from Cochrane Corp., 17th and Allegheny Ave., Philadelphia, 32, Pa.

THERMOMETERS—Principle of operation of liquid-filled, bimetallic vapor-tension and gas-filled thermometers and technical information on thermometry is contained in Bulletin No. T-800, "Recording Thermometers," available from The Bristol Company, Waterbury, Conn.

COAL STORAGE—Notes on the storage of bituminous coal, how to install hot-spot indicators and renewal of fuses, also a method for quenching fires are presented in Bulletin 100, which may be obtained from Coal Specialties Co., 50 Church St., New York, N. Y.

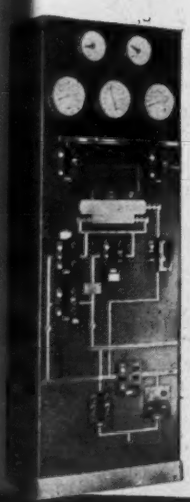
PERSONNEL RECORDS—An 88-page manual covers record keeping phases of personnel management in theory and in actual illustration of methods now employed. Copy of "Personnel Administration—Records and Procedure" may be obtained from Systems Division, Remington Rand, Inc., Buffalo, N. Y.



THE MISSING MAN...

...who isn't missed!

With Limitorque Controls, the familiar sight of a workman climbing around to open or close valves is missing. Now he stands firmly on the floor, merely reaches out and pushes a button on conveniently located control station or a master control panel. Presto . . . the valves operate quickly, dependably and safely.



A typical Limitorque Control Panel

Philadelphia Limitorque Valve Operators have been installed in Hydro-electric plants, central stations and private power plants in all parts of the country where, without fail, they are opening and closing valves from 3" to 96" diameter.

Limitorque fits all types of valves and is readily adaptable to present equipment.

For new installations or to secure better control in existing stations . . . investigate Limitorque. Our catalog that gives details will be gladly sent on request.

PHILADELPHIA GEAR WORKS, INC.

INDUSTRIAL GEARS AND SPEED REDUCERS — LIMITORQUE VALVE CONTROLS

Erie Ave. and G St., Philadelphia 34, Pa. • New York • Pittsburgh • Chicago

NEWS ABOUT PEOPLE

Public Service of N. J. Promotes G. H. Blake

Public Service Corp. of New Jersey has elected George H. Blake to the recently created position of executive vice-president. Mr. Blake, who joined Public

Service in 1910 as a trial attorney, has been vice-president and general solicitor of the corporation and its subsidiaries for the past six years. He has been a director of the corporation since 1934 and a member of the executive committee of the corporation's board of directors since 1935.

A graduate of New York University, Mr. Blake was admitted to the bar in 1908 and practiced law with Edwards & Smith in Jersey City until 1910. He started with Public Service in that year in Jersey City, was made assistant general solicitor of the corporation and its subsidiaries in 1921 and general solicitor two years later.

•

▶ HAROLD L. DURGIN, chief engineer of the Central Vermont Public Service Corp., Rutland, since 1935, and previously electrical engineer for that utility and the Twin State Gas & Electric Co., Dover, N. H., has been elected a vice-president of the Central Vermont company.

▶ H. L. DOOLITTLE, chief design engineer, Southern California Edison Co., has retired after more than 33 years of continuous service with the Edison company. A native of California, Mr. Doolittle became identified with the company in 1909 as a draftsman in the general office. From that time on he held various positions in the engineering department until 1926, when he was appointed to the position held at the time of his retirement. He was one of the leaders of the engineering group during the construction of the company's major transmission network and has also acted as consultant in many other engineering matters.

•

Bourland Joins Street Lighting Safety Bureau

Hal M. Bourland of Columbus, Ohio, has been appointed secretary of the Street and Highway Lighting Safety Bureau, according to announcement by A. F. Dickerson, chairman of the executive committee. Mr. Bourland succeeds Alleyn H. Beamish, who is now with the Tax Foundation.

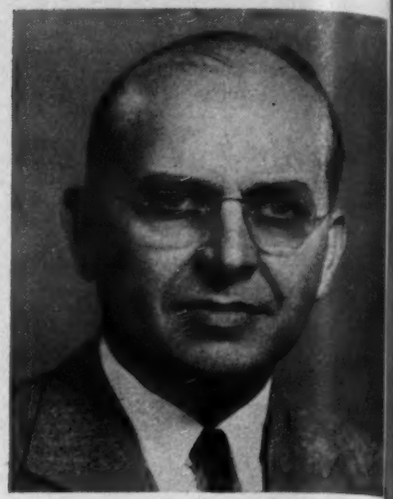
Mr. Bourland comes to this post from Ohio, where he was associated with Hal G. Sours, director of the Ohio De-

partment of Highways, and George C. McConnaughey, chairman of the Ohio War Transportation Committee. Prior to that he was publicity counsel for major transportation companies and trade associations in Houston, Texas.

Stuart Made Manager of Lamp Division

Appointment of Ralph C. Stuart as manager of the lamp division of the Westinghouse Electric & Manufacturing Co., with headquarters in Bloomfield, N. J., has recently been announced.

Mr. Stuart, who has been with the



Westinghouse Electric & Manufacturing Co. and the Canadian Westinghouse Co. for 25 years, will have charge of all activities of the lamp division, including sales, illumination engineering, district office activities of the lamp division, as well as manufacturing and engineering in the division's five plants in New Jersey and West Virginia.

He went to the Bloomfield headquarters plant of the division in 1941, having been transferred from the West Plant of the Canadian Westinghouse Co. at Hamilton, Ont., where he had been manager from 1930. Mr. Stuart started with Westinghouse at the Bloomfield Works in 1918 and after serving in the U. S. Army he returned there in 1919. The following year he was transferred to the Canadian Westinghouse Co.

•

▶ ARTHUR SLEPIAN, formerly general manager of the Wheeler Insulated Wire Co., has recently become vice-president. Mr. Slepian is affiliated with the wire and cable division and the magnet wire section of the National Electrical Manufacturers Association.

▶ R. E. FORMAN, formerly chief designing engineer of the Pacific Power & Light Co., has been appointed superintendent of construction and maintenance to fill the vacancy caused by the death of C. S. Knowles. The appointment of A. E. BOND, formerly assistant distribution engineer to Mr. Forman, former position was simultaneously announced. C. L. BROWN, formerly division engineer at Walla Walla, Wash.

...s at the same time transferred to ...rtland to take over Mr. Bond's former ...ties as assistant distribution engineer.

•

...owell Made Manager of G.E. Meter Division

E. H. Howell, since 1930 manager of ...neral Electric Co.'s Toledo, Ohio, ...ice, has been named manager of the ...mpany's meter and instrument divi...on with headquarters at Lynn, Mass. ... succeeds W. F. Howe, who will be ...tained as consultant. Mr. Howell was

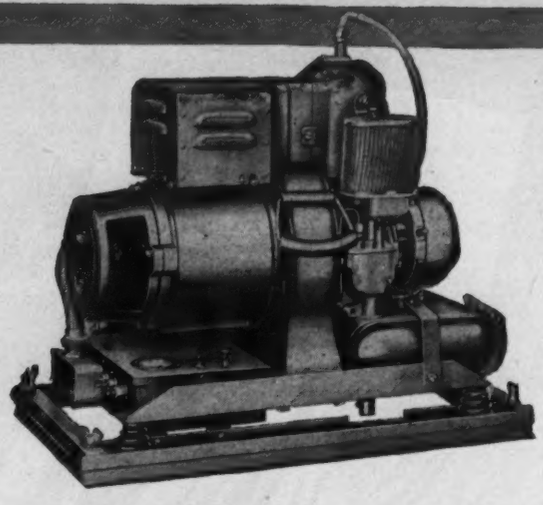
...H. Howell

...orn in Shawneetown, Ill., and was ...raduated from the Georgia School of ...echnology in electrical engineering in ...922. He entered the testing depart...ent of General Electric soon after; ... 1924 was transferred to the Pitts...eld Works transformer test and in ...925 became transformer specialist at ...he company's Cleveland office. From ...925 to 1930 he was manager of the ...Memphis, Tenn., office.

In 1942 Mr. Howe became manager ...f the meter division, succeeding Frank ...C. Vaughen, who retired at that time. ...Mr. Howe had been in the meter divi...on since 1901, when he was trans...erred from West Lynn to Schenectady ... assume the duties of meter specialist ... the meter and switchboard depart...ent. In 1909 he became assistant to ...Mr. Vaughen, then sales manager of ...he meter department. In 1923 he was ...promoted to general assistant in the ...eter division of the central station ...epartment, later becoming assistant ...anager.

• •

JOSEPH F. W. MORRISON, city attor...ey for Stuttgart, Ark., has been ap...ointed by Gov. Homer Adkins a mem...er of the state Department of Public ...tilities. Mr. Morrison succeeds Arthur ... Johnson, who died recently, after



HOW YOU CAN GET

NEW!

HOMELITE

PORTABLE GENERATORS

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Sooner than you think!

This war doesn't have to last forever. We can shorten it considerably. We can get it over quickly . . . if we do all that is expected of us. This means investments . . . heavy investments . . .in War Bonds. For the more money we can turn into equipment for Victory, the sooner we can get back to the delivery of equipment you need for your work . . . Homelite Portable Generators, for example, better than ever before.

★ ★ ★

Every Homelite worker is buying War Bonds regularly And every Homelite worker is doing everything possible to speed Victory through ever-increasing production.

ARMY E NAVY

HOMELITE CORPORATION

PORT CHESTER, NEW YORK

This
NEWSPAPER
advertisement was published in Washington, New York and Chicago by McGraw-Hill, to make friends for business.
Kelly

Have you ever been out of a job?

What you can do

The best way to insure good jobs and better living is to create an environment favorable to continuous industrial progress.

The best way to insure healthy industrial progress is through a nation-wide understanding of the fact that we live better through doing more work in less time.

Nation-wide understanding of that fact will result in laws that encourage industrial progress.

Nation-wide understanding always will be a will-o-the-wisp, unless each business man does his share of: (1) Understanding his own responsibilities in maintaining industrial progress; (2) Explaining the relation between *good* business and good living to his employees and neighbors.

The newspaper advertisement reprinted here is McGraw-Hill's share in the job of explaining the source of good living. It has appeared in Washington, New York and Chicago, as well as in all McGraw-Hill publications. It is available, for use over your own company signature, in your plant city. A mat, six-column size for newspaper reproduction, will be sent to you upon request. Booklet reprints are also supplied at cost ($10.00 per thousand).

James H. McGraw, Jr.
President

McGraw-Hill Publishing Company, Inc.

IF you have ever been out of a job, and if you had a wife, children and slender resources at the time, then the fattest paycheck will never quite obscure the memory of the days and nights you lived with fear.

Some of that fear lingers in every man's mind, for all have suffered in some degree.

► That's why you hear the words "postwar planning" so often. Americans are determined that, one way or another, they are going to keep our thousands of factories going after the war, so that there will never again be a vast army of unemployed.

As usual, in a democracy, there are two entirely different ideas as to how to make 56 million jobs grow after the war, where only 46 million existed before.

Both kinds of people, who hold these different ideas, sincerely want to make the postwar world a better place for you to live in. They have complicated arguments, backed by lots of figures.

But when you trim all the arguments and figures down, you find that one side believes in DIVIDING jobs to make them go round, and the other side believes in MULTIPLYING jobs so there will be greater opportunity for all.

We believe in the MULTIPLYING plan for making postwar jobs and ask you to believe in it too.

Look back over our history. What made us great? Was it rich soil? Africa's is as rich. Was it

FREE MATS: If you would like to publish this message over your own company name, or distribute it in handy booklet form, write or wire: Research Dept., McGraw-Hill Publishing Co., Inc., 330 West 42nd St., New York (18), N.Y.

Have you ever been out of a job? (cont'd)

atural resources? China has them in abundance.

NO, the greatness and the good living of merica is the direct product of her genius for oing more work in less time.

Invention is the source of improvement, and *nprovement* is the multiplier of jobs . . . when roducts are improved in service or style, or low- ed in price, new customers are attracted and ew jobs created.

That's why it is true that good living has its ource in industrial progress.

When industrial progress is interrupted, we ave a depression, and there is less good living.

When (through courageous investment in new nd better products) industrial progress is resumed, e go on to even higher levels of good living.

► If every able-bodied person in America is to ave a job, then we must all understand the things hat make good living possible, and we must all elp *improve* the methods that have given so much ood living to so many people already.

For businessmen, that means a constant search or improved methods and machines, a regular ear-after-year investment in industrial progress. his means avoidance of such things as specula- ion in inventories that tend to create booms and epressions rather than consistent progress.

For every citizen, it means a constant search or the best ways and means to prevent and cure epressions.

Businessmen, alone, cannot prevent bad times. t's a job for *every* citizen. Every American can elp just by knowing that good living comes from oing more work in less time. If you, and all other mericans, swing on to that fact, the laws that ontrol our rate of industrial progress will be etter designed to keep the improvement engine unning.

That's where government really can be helpful n postwar planning.

It can encourage the "take a chance" spirit hat is the basis of all progress. And it can improve he measures which prevent and cure depression.

At present, our laws are not framed to encourage investment in new and better methods.

Many local, state and national taxes work out in favor of keeping an old machine, instead of buying a new one.

► There are tens of thousands of machines in the country that are over 20 years old. Even our shiny new war equipment is living 3 years in one, and will be old when the war is over.

Every machine should be regarded as obsolete as soon as it is installed and work started on a better one. In the long run, that is the best way to multiply jobs and create better living. Our laws should *encourage* the process, not *discourage* it.

New machines can only be bought with the profits created by old machines. The money that is laid aside by industry to develop and buy new machines is called "Seed Money." If laws take away too much of the Seed Money of business, that will prove disastrous. High taxes must be paid, but they should not destroy Seed Money, which is the only source of improvement.

That's why it's so important for everyone, no matter what his walk in life, to know this fundamental fact:

"Industrial Progress
is the Source of all Good Living."

THE McGRAW-HILL NETWORK OF INDUSTRIAL COMMUNICATION

24 publications, which gather "war-news" from the "war-production-front" through a staff of more than 153 editors and 725 engineer-correspondents . . . More than 1,500,000 executives, designers, production men and distributors use the editorial and advertising pages of these magazines to exchange ideas on war-production problems.

McGRAW-HILL BOOKS

Publishers of technical, engineering and business books for colleges, schools, and for business and industrial use.

This advertisement is available in handy booklet form. (Less than 100 copies free. Larger quantities, $1.00 per 100; $10.00 per 1000.)

McGRAW-HILL

PUBLISHING COMPANY, INC. . . . BOOK COMPANY, INC.

330 WEST 42ND STREET, NEW YORK (18), N. Y.

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merican Machinist • Air Transport • Aviation • Aviation News • Bus Transportation • Business Week • Coal Age • Chemical & Metallurgical Engineering onstruction Methods • Electrical Contracting • Electrical Merchandising • Electrical West • Electrical World • Electronics • Engineering & Mining Journal • & M. J. Metal and Mineral Markets • Engineering News-Record • Factory Management & Maintenance • Food Industries • Mill Supplies • Power • Product Engineering • Textile World • Wholesaler's Salesman

usiness Publishers International Corporation, an affiliate, publishers of Business and Technical Magazines for Latin America, and Overseas Circulation

Today more than ever...

ORANGEBURG FIBRE CONDUIT

Gets the Call for Cable Protection!

• Engineers on wartime construction jobs are specifying Orangeburg Fibre Conduit more and more for protection of cables carrying vital power, light, fire, telephone, and signal services in war plants, power plants, shipyards, airports, cantonments, and naval bases.

• There are many reasons for this increasing preference. By using Orangeburg Conduit instead of metal, critical materials are conserved. Orangeburg provides *complete* cable protection *underground* or *underfloor*—yet costs less than metal conduit. Does not corrode; joints and conduit are water-tight. The surface of Orangeburg Fibre Conduit will not corrode cable sheath and long pulls are possible with minimum friction. It is light in weight—assembles and installs faster—saving time and cutting cost of installation.

• Cable repairs and extensions are simplified, too. New cable is pulled in easily and economically without damage and without ripping up ground or construction. Write for further information today.

ORANGEBURG STANDARD CONDUIT
for installation with concrete encasement

ORANGEBURG NOCRETE CONDUIT
for installation without concrete encasement

THE FIBRE CONDUIT COMPANY • ORANGEBURG, NEW YORK

Distributors:

GENERAL ELECTRIC SUPPLY CORP. GRAYBAR ELECTRIC CO., INC.

THE FIBRE CONDUIT CO. ORANGEBURG PAT. OFF. ORANGEBURG, N.Y.

ORANGEBURG

WITH 50 YEARS EXPERIENCE IN THE MANUFACTURE OF NON-METALLIC CONDUIT AND PIPE, SERVES THE POWER AND LIGHT, TELEPHONE, GENERAL CONSTRUCTION, CHEMICAL, PETROLEUM, PLUMBING AND BUILDING SUPPLY FIELDS WITH ELECTRICAL FIBRE CONDUIT . . . ELECTRICAL UNDERFLOOR DUCT SYSTEMS . . . AND FIBRE PIPE FOR NON-PRESSURE USES.

serving on the three-member commission only a few months. Mr. Stuttgart has served six terms as Stuttgart city attorney. He is a native of Indiana, was educated at Stuttgart, Ark., and received his law degree at the University of Kentucky.

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S. E. E. Appoints New Section Chairmen

Rex I. Brown, president of the Southeastern Electric Exchange, has recently announced the appointment of the following chairmen to direct the sectional activities of the Exchange during the ensuing year:

Engineering and operation, P. J. Carlin, Florida Power & Light Co.; sales, Hugh G. Isley, Carolina Power & Light Co.; accounting, R. E. Howard, Jr., Alabama Power Co.; employee activities, T. Norman Jones, Virginia Electric & Power Co.

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► FRED W. CLOUGH, assistant superintendent of electrical distribution, Northern Berkshire Gas Co., North Adams, Mass., who has been connected with the New England Power System since 1924, has resigned as of September 15, next.

► JOHN S. MESSER is now vice-president and general manager of Economy Fuse & Manufacturing Co. He was formerly a division sales manager located in New York. Mr. Messer will be an executive and voting representative in the fuse section of the National Electrical Manufacturers Association.

► WALTER STOREY, formerly farm service consultant for the Puget Sound Power & Light Co., has been appointed manager of the Tacoma office, succeeding the late Kenneth B. Panchot. Mr. Storey is familiar with the Tacoma territory, having become associated with the Puget Sound utility's sales department in that city in 1900. He has worked in Kent, Puyallup and Sumner and has held a variety of positions which have given him an exxcellent background in the light and power business.

► H. FORD DICKIE, section head in the East Plant motor division of the Pittsfield, Mass., works, General Electric Co., has been appointed head of the distribution transformer production section at Pittsfield. He entered the company's employ in 1935 as a student engineer, being a graduate of the University of Kansas, later being transferred to the production training course. For a time he was on budget control work. E. E. CURRY has been named assistant section head of the South Side division at Pittsfield and H. L. FRANCIS has

been appointed production section head of the East Plant motor division, replacing Mr. Dickie. Mr. Curry joined the company in 1907 and Mr. Francis entered its service in 1935.

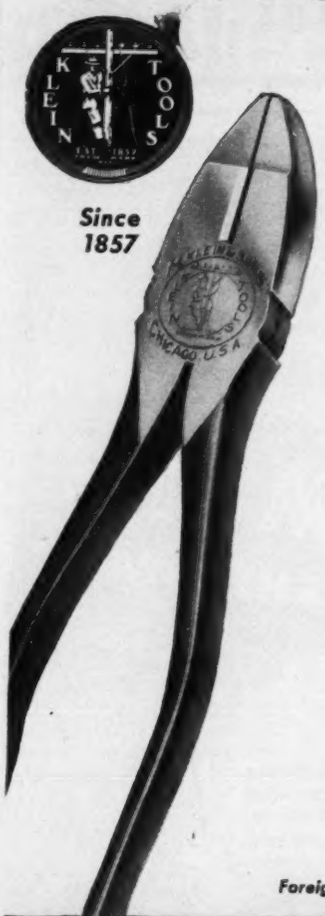
▶ ALFRED S. WALKER has been appointed assistant vice-president of the New England Power Co., Boston; the Connecticut River Power Co., Boston, and Bellows Falls (Vt.) Hydro-Electric Corp. Mr. Walker has been with the New England Power System for 30 years, covering a wide range of operating duties, including many years as assistant to vice-president C. R. Oliver, and since the outbreak of the present war, special responsibilities in relation to the army, navy and civilian defense organizations.

▶ HENRY OBERLE, superintendent of electric transmission and distribution for the Queens Borough Gas & Electric Co. since 1923, has resigned to become district office manager in New York for the Copperweld Steel Co. Mr. Oberle was graduated from Montana State College in 1920, after which he completed the General Electric test course. He was employed as a General Electric service engineer in New York and later served with the Public Service Electric & Gas Co. in Newark, N. J., before joining Queens Borough Gas & Electric Co.

▶ R. A. DEVLIEG has been appointed vice-president in charge of manufacturing of the Nash-Kelvinator Corp., Detroit. HAROLD E. LONG was named works manager in charge of Kenosha operations of the Nash motors division of the corporation. Since 1941 Mr. DeVlieg has been a vice-president of the Nash motors division, heading up manufacturing in the company's Wisconsin plants in Kenosha and Milwaukee. In his new position he takes charge of manufacturing of all Nash-Kelvinator plants throughout the country. Mr. Long has been identified with Nash since 1917.

▶ GEORGE M. MUSCHAMP and PAUL L. GOLDSTROHM have been appointed vice-presidents of the Brown Instrument Co., Philadelphia. Mr. Muschamp will be vice-president in charge of engineering and Mr. Goldstrohm will be vice-president in charge of production. Both positions are newly created. Mr. Muschamp has been with the Brown engineering department for 12 years and has been in charge of engineering for the past three years. He directed the development of a number of Brown electronic devices, including the electronic potentiometer for controlling industrial temperatures and the flight recorder, which is being widely used in testing war planes. Mr. Goldstrohm recently celebrated his twentieth year with the com-

Back on the Job with KLEIN'S



MANY linemen—electricians—and other Klein users are today engaged in the important job of maintaining communications on our war fronts all over the world.

In the service of men at the front, Klein equipment is winning even higher esteem than ever before. For today, practically all of Klein's production goes to the Army, Navy, and to war workers.

When the war is won and these men return to American industry, they will find Klein pliers and wrenches, climbers and grips, safety straps and belts ready to serve them on their peacetime jobs.

The name "Klein" will continue to mean the highest in quality then as it has "since 1857."

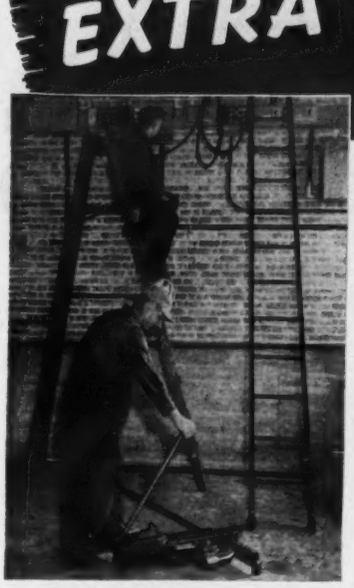
Back home, one contribution we can make to speed Victory is the conservation of tools and equipment. To help in this important job, Klein has prepared an illustrated pocket manual on the care and correct use of tools to assure their long life. A copy will be sent to anyone interested.

ASK YOUR SUPPLIER

Foreign Distributor: International Standard Electric Corp., New York

Mathias KLEIN & Sons
Established 1857 — Chicago, Ill., U.S.A.
3200 BELMONT AVENUE CHICAGO

EXTRA MANPOWER with GREENLEE BENDERS



Shown above is the Greenlee No. 770 Bender with radius shoe attachment. With one forward stroke of the ram, a smooth, neat-looking, 90° bend is made in a jiffy.

● It's easier to get along short-handed these days if you have tools to eliminate long, tedious hours of hard work. And there's less absenteeism, too, when you have tools that lessen the physical strain on your men. Good tools provide extra manpower—help get more work done—speed up jobs. When you need better tools for essential jobs, investigate the current line of Greenlee Tools. You'll find Greenlee Benders, for instance, will provide extra manpower for all bending jobs, large or small. They are powerful, portable, easy for one man to operate.

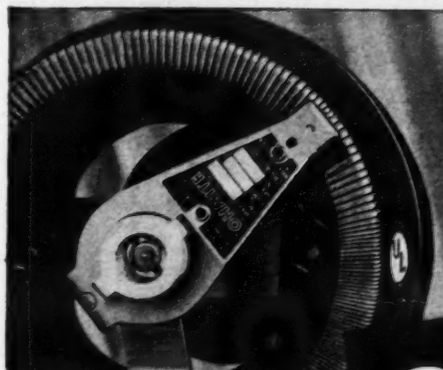
There's A Greenlee Bender For Every Job!

Whatever you have to bend—tubing, E.M.T., heavy-wall conduit, or bus bar—there's a Greenlee Bender, including powerful hydraulic units, that will help ease your manpower problems.

SEND FOR BENDER BOOKLET NO. 5-116

Greenlee TOOL CO.

1809 Columbia Ave. • Rockford, Illinois



SMOOTHER, CLOSER CONTROL OF GENERATOR VOLTAGE...

OHMITE *Field* RHEOSTATS

OHMITE compact generator field rheostats are tapered or uniformly wound for separately or self excited generators. Continuous variation of resistance in even the smallest sizes—saves control-panel space! Ten wattage sizes from 25 to 1000 watts, in single or tandem units—suitable for every size generator. Hundreds of standard listings covering the range from 24-32 volts to 320-400 volts.

Send for Catalog and Engineering Manual No. 40.

Write on company letterhead for this helpful 96-page guide.

BE RIGHT WITH OHMITE RHEOSTATS · RESISTORS · TAP SWITCHES

OHMITE MANUFACTURING CO.

4949 FLOURNOY ST., CHICAGO 44, U.S.A.

pany. He has been serving for the past two years as assistant general manager and formerly was the company's purchasing agent.

► WILLIAM R. ZUHLKE, formerly executive engineer for American Radiator Co., has joined Chrysler Airtemp Division as staff engineer. Mr. Zuhlke will coordinate activities of the home office engineering staff and laboratory and will later study heating markets with respect to the development of a post-war line of heating equipment.

► J. W. PECKHAM has been appointed manager of the development and design engineering department for the Bristol Co., Waterbury, Conn. A graduate of Rhode Island State College, Mr. Peckham was identified with the radio research department of the General Electric Co. before entering the radio engineering department of the Bristol Co. in 1922. In 1940 he was appointed Pacific Coast district manager, in charge of the company's San Francisco, Seattle and Los Angeles offices and San Francisco branch factory. Mr. Peckham will make his headquarters at the company's general offices in Waterbury, Conn.

► NORMAN R. FRAME, assistant secretary of the Western Electric Co., has been elected secretary of the company to succeed HARRY B. GILMORE, who retired on September 1 after 41 years of service. Mr. Frame's career with the company covers 20 years.

► MARCELLO A. KING has joined the Worthington Pump & Machinery Corp. as executive engineer of its Moore steam turbine division, Wellsville, N. Y., in charge of design, research, testing and service. Engaged in turbine engineering and manufacture since his graduation from the University of Michigan in 1916, he was with the Kerr Turbine Co. and later with the Elliott Co., where he held the position of manager of engineering.

► H. B. HODGINS, an application engineer for the Westinghouse Electric & Manufacturing Co. in the Spokane area since 1935, has been named manager of the Spokane office. Mr. Hodgins is a member of the American Institute of Electrical Engineers and of the Associated Engineers of Spokane.

► F. B. PHILBRICK, formerly Pacific Coast district manager, is now president and general manager of the Gamewell Co., Newton Upper Falls, Mass. A graduate of the Massachusetts Institute of Technology, Mr. Philbrick commenced his engineering career in the testing department of the General Electric Co., Schenectady, N. Y., in 1918. During 1919 and 1920 he was an in-

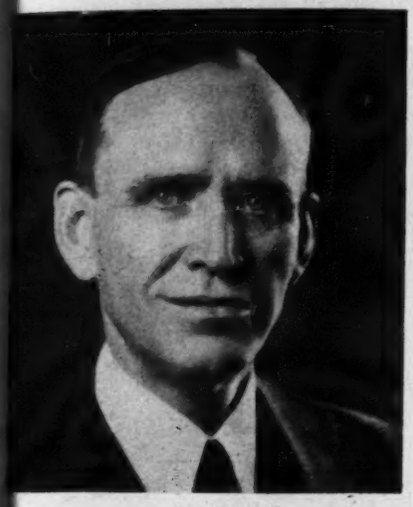
tructor at the Massachusetts Institute of Technology, Cambridge. He joined the Gamewell Co. in 1920 as assistant engineer. In 1924 he became engineer in charge of the drafting room and in 1927 assistant chief engineer. From 1929 to 1937 he was district sales manager of the Pacific Coast states. Since 1937 he has been manager for that district.

OBITUARY

F. H. Rosencrants

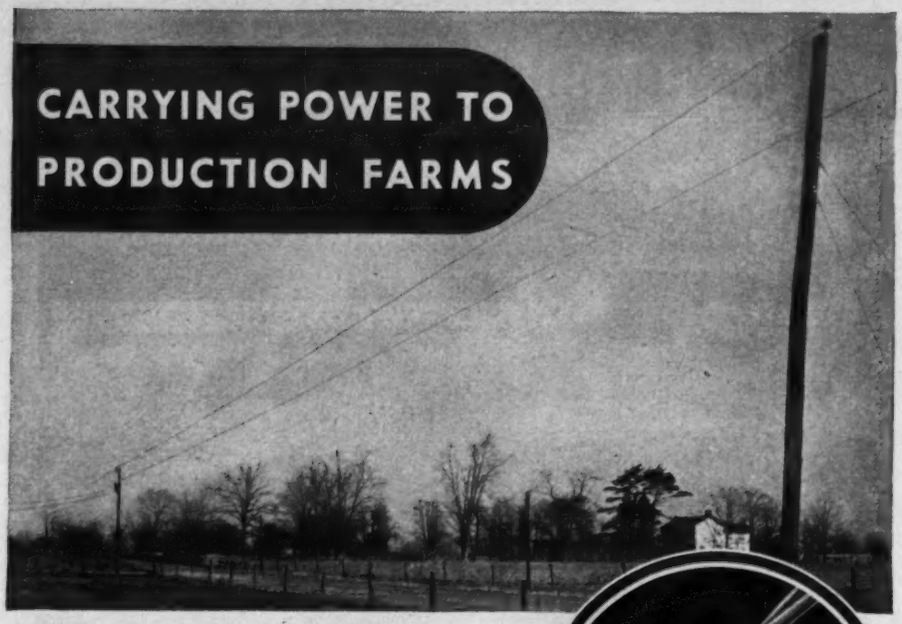
F. H. Rosencrants, vice-president of Combustion Engineering Co., Inc., and a recognized authority on steam power plants and boiler design, died suddenly at his home in Scarsdale, N. Y., on August 26.

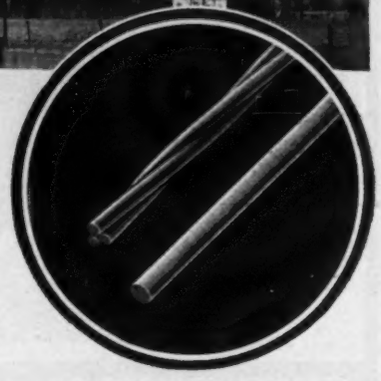
A graduate of the University of Ne-



braska and later professor at Oregon State College. Mr. Rosencrants entered the utility industry as mechanical engineer for the Texas Power & Light Co. in 1916, remaining in that capacity for two years. From 1918 to 1924 he was connected with the Electric Bond & Share Co., in charge of designing steam power stations. From 1924 to 1930 he was director of engineering for International Combustion Engineering Co., Ltd., of London, England. Returning to the United States in the latter year, he became vice-president of Combustion Engineering Co., Inc., New York, and for the last two years was in responsible charge of the vast program which his company had been called upon to meet in building boilers for the U. S. Maritime Commission and the U. S. Navy. He was also identified with the design of the first large high-pressure forced circulation boiler to be installed in this country and with the design of chemical recovery units for the paper mill industry.

Mr. Rosencrants was an active mem-





Crapo
STEEL
CONDUCTOR

THOUSANDS of the nation's food producing farms are being electrified during this critical period, thanks to Crapo Steel Conductor. This efficient conductor material—conceived during World War I, perfected and proved in on rural lines during the peace years—was ready to meet the needs of the current war emergency when these arose.

Crapo Steel Conductor, developed specifically for the overhead transmission and distribution of power, provides a combination of physical strength and electrical efficiency never before available in ferrous wire.

Its extra high tensile strength makes possible long spans with flat sags and greater ground clearances, reduces the number of pole structures required, saves critical man-hours and materials. Electrically, this conductor is unique because of its low 60-cycle resistance, low magnetic permeability and low 60-cycle reactance.

Write for New Engineering Manual

For rural extensions authorized by Utilities Order U-1-c, specify No. 6 B.W.G. Crapo HTC-130 Stranded (3-wire) Conductor—the size and type recommended for the purpose!

For information on other applications, contact the nearest office of the Graybar Electric Company Inc., Distributors! Or, write direct for the new engineering manual containing complete information about Crapo Steel Conductors!

INDIANA STEEL & WIRE COMPANY
Muncie . . . . Indiana

Crapo HTC-130
STEEL CONDUCTORS

TO HELP YOUR FOREMEN MEET *today's and tomorrow's* PROBLEMS

Elliott Service Co. offers 7 PRACTICAL MANUALS

by Glenn Gardiner

HOW TO CORRECT WORKERS
HOW TO TRAIN WORKERS QUICKLY
QUALITIES OF A GOOD BOSS
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HOW TO CREATE JOB SATISFACTION
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Price for Set of 7 Manuals $2.65

Write for special low prices for any or all manuals in quantity

ELLIOTT SERVICE CO., 219 E. 44th St., New York 17, N. Y.

Please Be Patient

WE'RE SORRY. We know you may not be receiving your copy of ELECTRICAL WORLD on time and, wherever the trouble is within our own walls, we're turning handsprings to correct it. But much of the difficulty is entirely beyond our control, especially transportation. We are using special expediters to co-operate with the Post Office and the railroads, but that has merely kept deliveries from being worse than they are.

It isn't only the shipping out of the magazines, but the shipping in of paper, the shipping of engravings and proofs—a delay in any one of which means a delay of the whole product. And when a magazine is not ready another one takes its place on the press, with the result that it must then wait until a press is free. In other words, delays in printing these days are pyramided.

It is terribly embarrassing to have to acknowledge these delays because we have always prided ourselves in "coming out" on time, regardless. We will still do everything possible to try to improve conditions, but in the meantime we ask you to remember that both the railroads and the Post Office have had a tremendous load placed on them and are doing extraordinary jobs. We'll all do our best—please be patient with us.

ber of the American Society of Mechanical Engineers and the Institution of Electrical Engineers (British) and had been a frequent contributor of technical papers to various engineering societies.

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Robert A. Manwaring

Robert A. Manwaring, who retired two years ago after 55 years' service with the United Illuminating Co. of New Haven and Bridgeport, Conn., died at his residence in Branford, Conn., on August 22. He was 76 years old. At the time of his retirement he was serving as vice-president and general manager.

During his long association with United Illuminating Mr. Manwaring participated in the growth not only of that company but of the electrical industry as a whole. He helped design and install the generating equipment

used in New Haven and in Bridgeport and had much to do with the distribution system.

A native of Niantic, Mr. Manwaring became identified with the United Illuminating Co. in 1885 in New Haven and his first job was that of dynamo tender in the original plant on George Street. Three years later he was put on outside construction and maintenance work. In 1895 he was made foreman in charge of construction and maintenance and became assistant superintendent before being promoted in 1921 to manager of the New Haven division in charge of production, sales and maintenance. He was named general manager in 1936 and first vice-president three years later.

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▶ GUSTAVUS A. ANDEREGG, formerly cable development engineer for the Bell Telephone Laboratories in New York, died on August 14, of a stroke, at his

ummer home at Lockbourne, near Columbus, Ohio, at the age of 70. Mr. Anderegg, who retired in 1938, became a member of the Western Electric Co. in Chicago in 1902. He then taught for a year at Harvard and for three years at Ohio State University. He returned to the Western Electric Co's engineering department in 1908 and in 1913 was placed in charge of all lead-covered cable developments. He continued on cable projects after the Western Electric's engineering department was established as a part of Bell Telephone Laboratories. Mr. Anderegg was a fellow of the American Institute of Electrical Engineers.

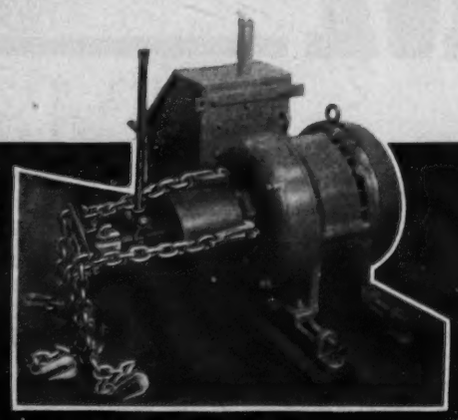
▸ CHARLES D. MOSS, for 35 years connected with the Tennessee Electric Power Co. and the Tennessee Valley Authority at Nashville, Tenn., died on August 10 at his home in that city. He was superintendent of the TVA power house in Nashville until his retirement last April on account of poor health. Mr. Moss was 64 years of age.

▸ WALTER L. WESTON, 69, former manager of the Woonsocket, R. I., division of the Blackstone Valley Gas & Electric Co. and connected with the Stone & Webster organization since being graduated from Harvard College in 1907, died at Concord, Mass., on August 22. During his career he also was manager of the Stone & Webster utilities at Tampa, Fla.; Paducah, Ky., and Houghton, Mich. He retired in 1936.

▸ ARTHUR J. JOHNSON, 62, one of the three commissioners of the Arkansas Utilities Commission and co-author of the 1935 law creating the commission, died suddenly at his home in Star City, Ark., on August 13. He served as state senator from 1909 to 1912 and again from 1934 to 1936. He was an unsuccessful candidate for governor in 1936. He studied law in the office of the late U. S. Senator Joseph T. Robinson. Owner of a newspaper,, a theater, a bank, and part owner of a short line railroad, he led an active business life.

▸ C. W. IRWIN, dealer co-ordinator of Pennsylvania Power Co., New Castle, Pa., died suddenly, of a heart attack, on August 13. Mr. Irwin organized dealer co-operative activities in the Pennsylvania Power Co. in 1935 and was instrumental particularly in the increased activities of appliance dealers in the sale of electric ranges and water heaters on the Pennsylvania Power system. Mr. Irwin had been employed by Pennsylvania Power between 1925 and 1929 in the capacity of merchandising manager and he was with the Bradford Electric Co. at Port Allegheny, Pa., from 1929 to 1935. He was 63 years of age.

Simplex Util-A-Tool Pulls Pulleys, Gears, Wheels and Couplings Faster and Easier!

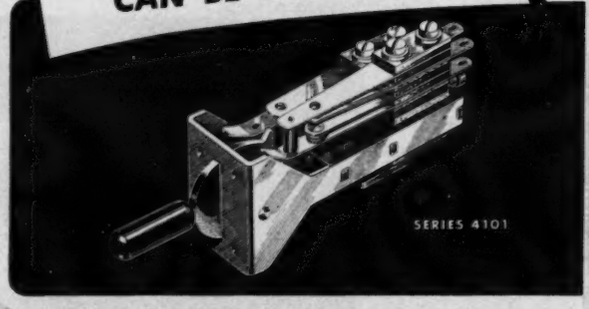


Spoked or plate center motor or generator pulleys, gears, wheels and couplings of any size are quickly pulled with this time-saving tool. Also used to push, pull together, clamp, lift, tension or bind. A necessity for every electrical construction and maintenance crew. Send for Bulletin "P&P-42."

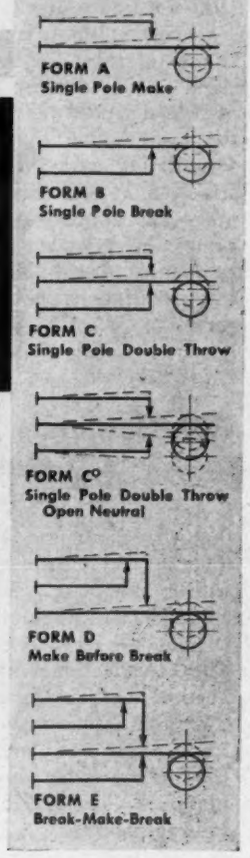
Templeton, Kenly & Co.
Chicago (44), Illinois
Better, Safer Jacks Since 1899

Simplex
LEVER - SCREW - HYDRAULIC
Jacks

ANY COMBINATION OF THESE BASIC FORMS CAN BE MADE . . .



BASIC CONTACT FORMS



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FOR ELECTRICAL CONTROL

● Available in five basic contact forms, the 4101 LEVER SWITCH can be obtained in combinations of these forms in a practically unlimited series of assemblies with either locking or non-locking action.

Constant adjustment is guaranteed by the heavily constructed chassis—positive action independent of contact springs—clean contact surfaces insured—rapid liberation of heat and the resultant continuous high capacity with long life.

Write for new catalog, now on the press, which gives complete details on contact forms—contact ratings—insulation—and other Mossman products.

MOSSMAN
Electrical Components

MANUFACTURING-MARKETS

Plans All-Year Gas Air-Conditioning

Planning now for the post-war period will do much to bring about a state of full employment after the war, Louis Ruthenburg, president of Servel, Inc., stated at a luncheon held recently at the Waldorf-Astoria Hotel, New York. The purpose of the meeting was to explain Servel's post-war plans for the manufacture and distribution of new all-year gas air-conditioning units for homes and small commercial establishments.

Mr. Ruthenburg said that through Servel's co-operation with utilities now, instead of waiting until after the war, its readiness to introduce gas air conditioning had been advanced a year and that, consequently, increased employment would be provided in the same ratio. Production on the new product will be started as soon as plant equipment can be obtained, which he said should be about three or four months after the war is over.

George S. Jones, Jr., vice-president in charge of sales for the company, presided at the meeting. He is in charge of Servel's post-war program to enlist the co-operation of gas companies in formulating marketing plans for the distribution of gas air conditioning and other gas appliances soon after peace comes. He revealed that 27 gas utility companies already have more than 300 test installations in the territories they serve.

•

Allis-Chalmers Will Get Big V Loan

Announcement has been made by the Allis-Chalmers Manufacturing Co. that it had completed arrangements with a group of twenty-two banks for a $75,000,000 Regulation V loan to aid in financing its increased war contracts. The First National Bank of Chicago is head of the banking group.

In addition to financing new war contracts of the company, this loan will be used to retire the company's prior Regulation V loan of $40,000,000 arranged in August, 1942.

Under the agreement the company will continue to pay 2¾ percent interest annually on the notes extended under the plan and is committed to pay one-fourth of 1 percent annually as a fee on the unused portion of the credit.

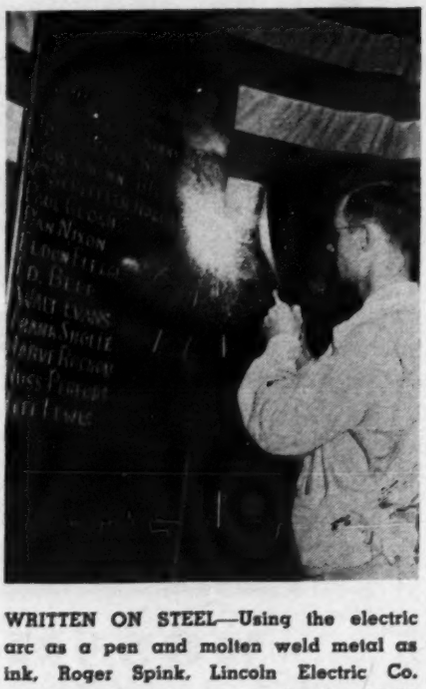
Notes are guaranteed to the extent of 75 percent by the Federal Reserve Bank of Chicago.

•

Western Electric to Open New Plant in Haverhill

Western Electric Co. has recently added to its facilities by establishing a new plant in Haverhill, Mass., in which from 1,500 to 2,000 additional people will be employed. It is expected that women will be employed at the rate of approximately 60 percent.

Two large mill buildings in Haverhill, the six-story Winchell Building and the adjoining eight-story Grad Building, have recently been leased by Western from the H. L. Hamel Leather Co.



WRITTEN ON STEEL—Using the electric arc as a pen and molten weld metal as ink, Roger Spink, Lincoln Electric Co. welder, adds his name to the list of 20 fellow workers now in military service

CMP School Planned for Manufacturers

Announcement has just been made that the war projects committee of the National Electrical Manufacturers Association is planning a Controlled Materials Plan School to be held in Cleveland, Ohio, at the Hotel Statler, September 22 and 23.

The attendance will be restricted to the manufacturers of electrical products only.

WPB has already promised to supply instructors and a program has been tentatively planned. It is expected that F. R. Fishback, president Electric Controller & Manufacturing Co. and chairman of the NEMA priorities and materials allocations committee, will be on hand for the opening of the Wednesday morning session. Walter C. Skuce, director, Controlled Materials Plan Division, WPB, will give the talk on "Where do we stand today in the development of CMP?" David Novick, director, Controllers Division, WPB, will probably cover the subject of materials and record-keeping. Two other speakers will be Walton C. Croce, assistant director, education and inquiry branch, CMP division, WPB, who will cover the subject of MRO, and Hardy M. Ray, chief, training section, education and inquiry branch, CMP division, WPB, who will probably discuss the purchase of non-controlled materials and components.

•

Manufacturers Make Sales Assignments

Electrical manufacturing companies have recently announced the following appointments to their sales staffs:

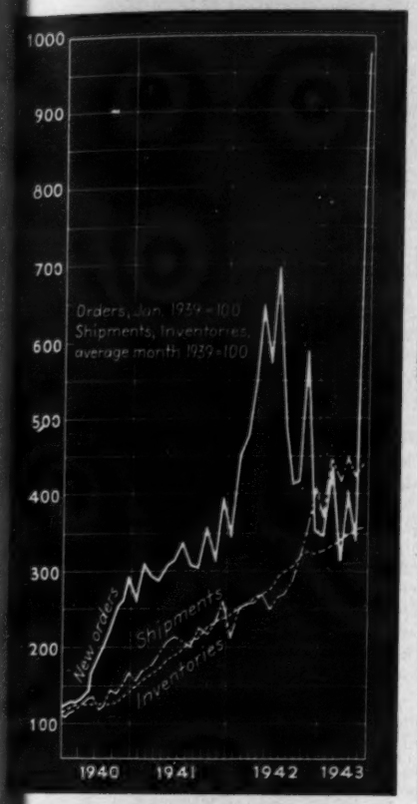
Railway and Industrial Engineering Co. has appointed Mark G. Mueller sales representative for the Denver district. Mr. Mueller became established in Denver as a sales representative in 1932. He was formerly a sales engineer for Century Electric Co. for eleven years.

Chrysler Corp. has appointed C. H. Carey district manager for the Airtemp Division in the Atlanta territory. Mr. Carey was recently connected with the Aviation Engineering Co. of Atlanta and for 15 years was associated with Crosley Corp.

Graybar Electric Co. has made A. D. Hammond manager of the Ohio Valley District. The headquarters of the district are in Cincinnati and there are branches at Columbus, Dayton, Ohio; Louisville, Ky. and Nashville, Tenn. Mr. Hammond, who has been with Graybar for 37 years, has recently been manager of the Birmingham, Ala., branch. In Cincinnati he is succeeding William H. MacCrellish, who has been transferred to New England. J. A. Taylor, formerly sales representative at Pensacola, Fla., has been made manager of the Birmingham branch.

Electric Machinery June Orders Double

New orders received by manufacturers jumped 16 percent in June from May. Practically the entire increase occurred in the durable goods indus-



ELECTRICAL MACHINERY INDICES of Bureau of Foreign and Domestic Commerce

tries, particularly the electrical machinery, whose new business was more than doubled. After dropping to 341 (revised) in May, from 406 the preceding month, the index rose sharply to 975 in June. This compares with 170 in June, 1942.

Index of the value of electrical machinery shipments turned upward in June to 439, comparing with 426 (revised) for May and with 249 in June, 1942.

Electrical machinery inventories' index also advanced slightly from 354.3 (revised) in May to 358.5 in June. This compares with 277.8 in June, 1942.

•

Completes Renegotiation

Renegotiation proceedings for the year ended December 31, 1942, between Formica Insulation Co. and the United States government have been completed and the company has signed an agreement with the War Department price adjustment board to return $1,000,000 of its 1942 profits on war contracts.

MAILING LISTS THAT WORK...

McGraw-Hill Industrial Mailing Lists are a direct route to today's purchase-controlling executives and technicians in practically every major industry.

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Field Reports on Business

Reports indicate that the electrical market is being influenced by the switch from defensive to offensive warfare, with a slackening of demand in some electrical lines and increased requirements in others. Retail trade throughout the country continues at levels substantially higher than last year.

NEW YORK

After months of expansion, production in war industries has fallen off below the requirement of the government's objectives and at the present time is spotty.

Civil engineering construction in continental U. S. totaled $40,638,000 for the week. This volume is 2 percent lower than in the preceding week and is 81 percent lower than in the corresponding 1942 week, as reported by *Engineering News-Record.*

Leading washing-machine manufacturers petitioned the War Production Board last week to permit them to unfreeze their production, claiming that halting all production had caused deterioration in cleanliness facilities. This condition, they maintain, is contributing to absenteeism among war workers and reduction in the working capacity of farm women. At a meeting with WPB representatives the producers were told that they must wait at least until next year before resuming civilian production.

Department store sales for the week ended August 21 were 15 percent higher than sales in the corresponding period of last year, the Federal Reserve Board has reported. This followed a gain of 4 percent in the preceding week.

NEW ENGLAND

As a result of co-operation among textile mill operators and of concerted action in bringing about release of much-needed electrical equipment, textile mills in this area, and in Rhode Island in particular, are buying small motors and control apparatus in larger volumes. Telemetering on the N. E. Power and the Conn. Valley Power Exchange has been put into service.

Walsh-Kaiser, Providence, R. I., has been awarded a new contract to build 32 combat-cargo vessels. Engineering services are being contracted by the Navy in connection with several construction projects in this area which should advance sales of wiring supplies for power and light. The demand for wire, cable and small switches for lighting installations aboard cargo-carrying type vessels under construction in New England shipyards is very active. At the present time the electrical market is largely influenced by the needs for carrying on offensive measure in warfare, toward the completion and equipment of vessels and the demands from manufacturers engaged in producing war materials; on the other hand, defensive projects, the construction of navy and army base facilities are slowing up noticeably, with a slackening of demand in some electrical lines quite apparent.

Bids have been submitted by manufacturers here for 500 small switches, 30 electric air type heaters, 600 Dykanol by-pass condensers, several lots of insulating materials, antenna wire and capacitors. Medfield, Mass., has called for bids on a new pumping station in which new lights will be installed and switch and control apparatus will be required. The National Housing Agency has approved the construction of 250 privately financed and 140 publicly financed family units to be built in Waterbury, Conn.

PACIFIC COAST

July building permits for the seven Western states gained slightly in volume over July, 1942, because of 15 percent and 75 percent increases, respectively, registered by Oregon and Washington. California decreased 15 percent, largely in Los Angeles area.

Electrical competitive conditions are becoming intensified as the various government departments slack off their buying. A bid of $207,531 has been made for constructing the 100-mile connecting line from Shasta Dam to Oroville, it being a single circuit, 230,000-volt wooden pole line of steel reinforced aluminum.

Orders include $449,660 to Harnischfeger for cranes and "facilities" at Watsonville, Calif.; weatherproof wire and hardware for Western Pacific automatic train control system in Feather River canyon, now under way with construction of the Keddie Tower; split tree insulators and other equipment for new forest service lines; $15,000 turbine parts for a pine lumbering firm; $60,000 of deck cable for Kaiser yard at Richmond; and $40,000 of coils and stator parts for a Pacific Gas & Electric generator. Pacific Electric Manufacturing Co. was low bidder on a small lot of circuit breakers for Bonneville system.

New industrial developments largely concern critical materials, such as an alunite treating plant at Marysvale, Utah, for Aluminum, Inc., a carbonate zinc treatment plant at Jean, Alaska, for Western Metals Co., with DFC allotment; a $4,000,000 alumina plant to be located in Washington or Oregon, and a graphite plant near Eureka, Calif. Mining and lumbering industries are considerably curtailed by manpower shortage.

CHICAGO

Investment in new industrial plants and for expansion of existing plant facilities in the Chicago area in August amounted to $16,742,000. This represents a decrease of nearly 37 percent compared with the preceding month's total of $26,440,000.

Industrial employment and wage disbursement in Chicago continue their well-established upward trend. Between June 15 and July 15 the employment rise was 0.6 percent and payroll increases 1.1 percent, according to the State Department of Labor.

Power output in the central industrial area was up 14 percent for the week ended August 21 over the same week of 1942. Output of the Commonwealth Edison group of companies increased 12.1 percent for the week compared with last year.

During the three-week period ended August 26, 1943, 94 Chicago area concerns received 117 war orders aggregating $7,227,000. This represents a sharp decline in the volume of war orders awarded in this area compared to the level maintained during the spring and early summer. Only listed orders for electrical equipment placed during the three-week period were two orders for insulation material, pilot lamps, d.c. milliameters and thermometers placed with the Drake Manufacturing Co. and the Simpson Electric Co.

Recent Rate Changes

WISCONSIN POWER & LIGHT CO.'s application to revise and simplify its rates in Sheboygan for commercial lighting, power and heating and cooking, has been approved by the Wisconsin Public Service Commission. P. H. Fischer, district manager for the company, who made the announcement, said that the net saving to approximately 16,500 customers would be slightly above $78,000 under the new schedules. Five schedules approved will replace a total of 22 rates of various types, many of them "inherited" from predecessor companies, he said. One of the more important changes is the abandonment of all rate schedules in which the connected load is a factor, Mr. Fischer said, adding that the new commercial lighting schedules are downward revisions of schedules under which more than 90 percent of commercial customers have been billed.

COLORADO PUBLIC UTILITIES COMMISSION has approved a voluntary decrease in electric rates for one section of the state, and disapproved a demand for rate reduction in another area. The approval: Public Service Co. of Colorado's request to lower power bills for customers in Estes Park approximately 20 percent, applying to all types of users. The disapproval: Highland Utilities Co.'s demand, based on an assertion that Western Colorado Power Co. discriminates against complainant by charging more than the rate schedules set up by other utilities serving the same class of users. Lowell D. Hunt, attorney for the Highlands company, Springfield, presented the case for his clients; was denied any relief or a rehearing. As a consequence, suit was filed in Denver district court for a review of proceedings.

GEORGIA POWER CO.'s reduced residential electric rates went into effect on September 1, along with bi-monthly meter readings. Walter R. McDonald, chairman of the Georgia Public Service Commission, which ordered the changes, estimated certain consumers would save $400,000 a year.

MESA (ARIZ.) UTILITIES BOARD has granted an electric rate reduction to the city and surrounding area—approximately 13 percent for the city and 28 percent for the suburban district. It is estimated that the new rate will amount to a $10,000 yearly reduction for city residents and approximately $35,000 for those residing outside the city.

ARKANSAS POWER & LIGHT CO. and city officials of North Little Rock, Ark., have reached an agreement concerning a new rate to be charged to the city for electric power for resale through the city-owned distribution lines. The new rate has not been made public and additional details remain to be worked out. The present contract expires October 1.

•

Charged with Monopoly

Department of Justice filed suit recently in federal court in New York against six companies, alleging a conspiracy to monopolize the distribution and installation of air-conditioning equipment. The defendants named were the following companies and their presidents: Auditorium Conditioning Corp., American Blower Corp., Carrier Corp., Ross Industries Corp., B. F. Sturtevant Co. and York Ice Machinery Corp.

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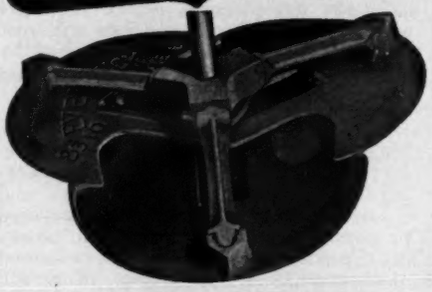

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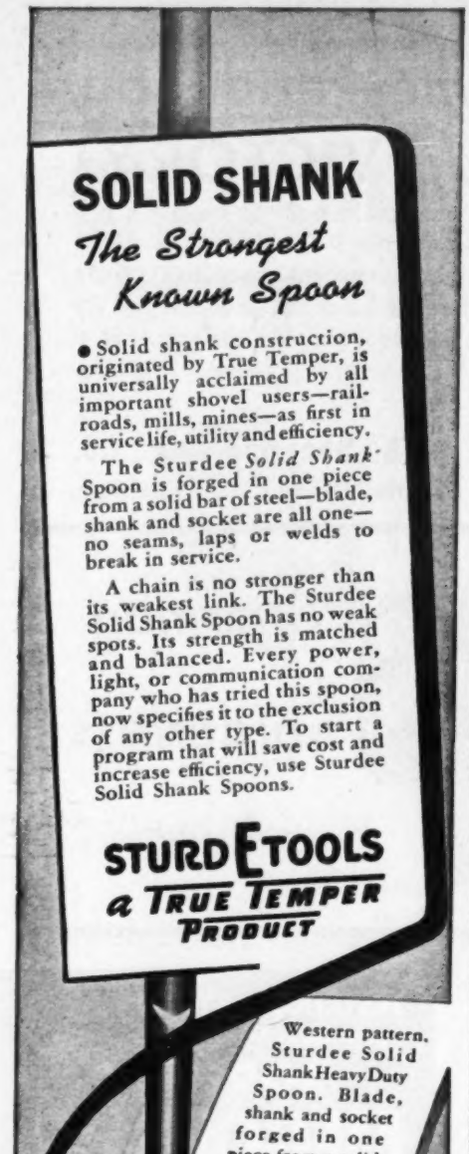
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Sales Opportunities

WASHINGTON—Department of Lighting, Seattle, plans modernization and improvements, with certain replacements in circuit breaker equipment and auxiliaries at steam-electric power plant and at four main substations in different localities. Cost estimated about $120,000. City Council will soon grant authority for work and provide fund in amount noted.

IOWA — War Department, Washington, D. C., has authorized new military cantonment, comprising shops, warehouses and miscellaneous buildings, with mechanical and electrical equipment. Also will install power substation facilities, with electrical distribution system, service connections, etc. Entire project will cost about $1,000,000, and will be supervised by U. S. District Engineer Office, Omaha, Neb. Proposed to begin work at early date.

NEW YORK—Agfa Ansco Division, General Aniline & Film Corp., Binghamton, plans new three-story addition, about 250 x 450 ft., with mechanical and electrical equipment for large capacity. Cost estimated close to $1,000,000, with financing by Defense Plant Corp. Proposed to carry out erection at once.

NEW JERSEY—Congoleum-Nairn, Inc., 195 Belgrove Dr., Kearny, plans installation of electrical equipment in connection with rebuilding of portion of plant, comprising main three-story building and adjoining structures, recently destroyed by fire, with loss estimated close to $1,300,000. Reconstruction will approximate about like amount, and will be placed under way soon.

CALIFORNIA—War Department, Washington, has plans under way for new military cantonment, with shops, warehouses and other industrial buildings, and installation of electrical and mechanical equipment. A power substation is planned, with electrical distribution lines, service connections and other operating facilities. Barracks, mess halls and miscellaneous service buildings will be erected. Entire program will cost over $1,000,000 and will be supervised by U. S. District Engineer Office, San Francisco. Proposed to begin work soon.

ILLINOIS—Republic Steel Corp., Republic Bldg., Cleveland, Ohio, will carry out expansion in a mill, comprising new building and installation of machinery and electrical equipment. Output will be used by government, which will provide financing through Defense Plant Corp., in amount of about $1,245,000 for project. Work will proceed at early date.

CALIFORNIA—Bureau of Power and Light, Los Angeles, has plans under way for new cooling water system for steam-electric generating station, with new intake works and two 8-in. reinforced-concrete pipe lines. Pumping machinery and other operating equipment will be installed. Project is estimated to cost about $380,000.

INDIANA—Schenley Distillers Corp., Lawrenceburg, plans extensions in steam-electric generating station. Project scheduled to be placed under way soon. Also expansion in another plant operated by a subsidiary interest. Extensions also in third steam-electric power plant; program estimated to cost about $550,000. Carl J. Kiefer is vice-president in charge of construction, with offices at company branch at 26 East Sixth Street, Cincinnati, Ohio.

COLORADO—War Department, Washington, D. C., has authorized a new military cantonment, comprising warehouses, shops and other industrial structures, with electrical and mechanical equipment. Also will build barracks, mess halls and miscellaneous service structures. A power substation is planned, with electrical distribution lines, service connections and other operating facilities. Complete project will cost about $1,000,000, and will be supervised by U. S. District Engineer Office, Denver. Proposed to begin work at an early date.

WASHINGTON—Henry J. Kaiser Co., Vancouver, operating a local shipbuilding plant, plans new transmission line and distribution system for power service at yard. Application has been made for a franchise to cover construction on several highways, and is expected to be secured soon. Main offices of company are in Latham Square Bldg., Oakland, Calif.

MICHIGAN—Packard Motor Car Co., 1580 East Grand Blvd., Detroit, has contracted with government for expansion in a plant, comprising additional building with mechanical and electrical equipment. Cost estimated about $1,500,000, with financing by Defense Plant Corp. Work will proceed at early date.

MISSOURI—Kansas City Public Service Co., 728 Delaware Ave., Kansas City, operating local traction system, has approved plans for new power substation at 87th St. and Woodland Ave., about 24 x 32 ft., for feeder service, and will begin work at an early date.

CALIFORNIA—War Department, Washington, D. C., has authorized new army air force station, comprising hangars, shops, warehouses and other industrial buildings, with electrical and mechanical equipment. Also, barracks, mess halls, administration building and miscellaneous structures. A power substation is planned, with electrical distribution system, service connections and other operating facilities. Cost estimated over $1,000,000. Project will be supervised by U. S. District Engineers Office, San Francisco, and will be placed under way immediately.

WASHINGTON—Public Utility District No. 1, Grays Harbor County, Hoquiam, plans extensions in transmission lines for power supply for an industrial plant in vicinity of city, making connection with present system at point near municipal pumping station. The project will be given a priority rating.

CALIFORNIA — Cutter Laboratories, Inc., Berkeley, manufacturer of drug and pharmaceutical products, will carry out expansion in plant for production for government, including additional building with mechanical and electrical equipment. Cost about $600,000, with financing by Defense Plant Corp.

ILLINOIS—American Radiator & Standard Sanitary Corp., Bessemer Building, Pittsburgh, Pa., has contracted with Government for expansion in plant, including additional building, with mechanical and electrical equipment for increased capacity. Cost estimated about $650,000, with financing by Defense Plant Corporation. Work on the project will be carried out at an early date.

ew REA Allotments Total $199,000

The Department of Agriculture re-ntly announced allocation of $199,000 Rural Electrification Administration n funds to eight systems in five tes, to complete sections of existing tems, to finance facilities already mpleted in accordance with WPB gulations, and to extend service im-diately to farms qualifying under esent WPB regulations permitting rms producing livestock, dairy and ultry products to connect to nearby al power lines.

In announcing the allotments which ing total REA allocations to $467,-1,295, of which $465,000 represents erations during the current fiscal ar, Administrator Harry E. Slattery d that no new construction will be dertaken except in accordance with thorization or regulation of the War oduction Board.

Details are as follows:

KENTUCKY—Jackson Rural Electric Co-erative Corporation, McKee, $54,000; uth Kentucky Rural Electric Coopera-e Corporation, Somerset, $40,000.

MINNESOTA—North Pine Electric Co-erative, Inc., Finlayson, $30,000.

NEBRASKA—Southern Nebraska Rural blic Power District, Grand Island, 0,000.

SOUTH CAROLINA—Pee Dee Electric Co-erative, Inc., Darlington, $15,000; Mid-rolina Electric Cooperative, Inc., Lex-gton, $15,000.

TEXAS—Erath County Electric Coopera-e Association, Stephensville, $20,000; nson County Electric Cooperative Asso-ation, Cleburne, $5,000.

•

G.E. Paid $127,515 for Suggestions in '43

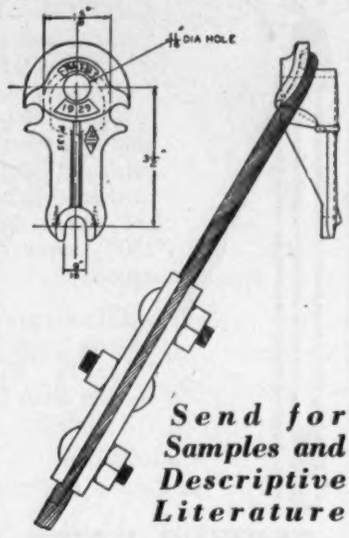
With two women employees receiving ighest individual honors, General Elec-ic workers during the first six months 1943 turned in worth-while produc-on suggestions at a rate 41 percent ove last year's record totals.

During the six-month period the mpany accepted 11,395 ideas for ving materials or time in war pro-uction, or only 4,809 less than the tire 1942 total. The amount paid ggestors during the first half of 43 was $127,515 as against $158,943 ring the previous twelve-month riod, highest annual figure since the stem was established in 1922.

Mrs. Edith Hogan of the company's est Lynn, Mass., plant received ,250, the highest award during the st six months of 1943. She suggested plan for breaking a bottleneck in the oduction of carefully calibrated dials electrical instruments much needed the armed forces.

Simplified Guying Specifications

Simplified guying construction has resulted from specifications built around three sizes of M.I.F. Through-bolt Guy Hooks for 5/8", 3/4", and 1" through-bolts with accessory Thimbleless Eye Nuts and Bolt Eyes, and Curved Ribbed Washers for Light and Power Companies constituting more than one-half the operating capacity of the U. S. and Canada. Now, when construction is restricted, is the time to investigate.



These fittings may be advantageously used first where through-bolt is already used to apply corner or dead-ending stresses to pole.

Test competitively with present guying specifications by sending assorted trial order at following 100-lot F. O. B. Branford prices:

P135 Guy Hook	$18.20/C
P128 Eye Nut	14.70/C
P126B Bolt Eye	24.50/C
P143 Curved Washer	7.70/C
PA-128-6 Anchor Rod (5/8" x 6 ft. Thimbleless)	66.70/C

Lower unit prices for larger quantities; or, we will send sample P135, P128, and P143 without charge or obligation in response to request on Operating Company letterhead.

Use the Guy Hook for anchor guys, and the Eye Nut or Bolt Eye for pole to pole and other relatively flat guys, and the Curved Washer to minimize slotting or splitting stresses in the pole. Fully described in our Simplified Guying Specifications folder.

Send for Samples and Descriptive Literature

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- —analysis of labor requirements
- —introduction of the new employee
- —difficulties with subordinates
- —opposition
- —stubbornness
- —disloyalty
- —dishonesty
- —immorality
- —irresponsibility
- —the agitator
- —difficulties with superiors and associates
- —responsibility for errors

SHOWS that executive technique is not a mysterious sixth sense, but a quality that can be definitely developed by anyone who will follow the simple methods laid down in this manual. Defines the tools of executive control; outlines the factors involved in the successful handling of others; gives practical and usable methods for getting a maximum output of work with a minimum amount of friction. In this edition a new chapter discussing the influence of the current emergency upon the various techniques of executive control has been added.

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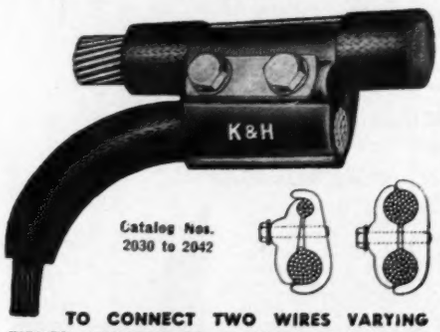

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LETTERS TO THE EDITOR

Sodium Lighting in Post-War

To the Editor of ELECTRICAL WORLD:

I think you have done an outstanding job in publishing your forecast for lighting in the July 24 issue of ELECTRICAL WORLD. It brings me up to date in many instances and I am sure will be useful in steering our industry in the right direction.

I appreciate that this survey is really an expression of many people and I cannot refrain from letting you know that I differ from those who have given you the impression that "more and more interest is being expressed in fluorescent and less and less in sodium." This statement is partly clarified in the following paragraphs, but I definitely believe the sodium lamp has an important place in post-war highway lighting. I think it will be used extensively, as you say, for underpasses, railroad crossings, intersections, bridges and bad curves, but I feel it will also be used for tunnels, by-pass routes around important cities and straight stretches of highways in built-up rural sections.

We have received most favorable maintenance reports from the many large installations of sodium lighting now in existence. One company with an installation of more than 400 units reports that lamp life is now averaging nearly 3,000 hours, flash breakage is less than 1 percent and maintenance expense of the reflector is nil, as the units have not been cleaned for six years. I thing you will find, as we learn more about how inexpensive sodium lighting maintenance is, that it will gain favor and will ultimately be considered the least expensive lighting for the various classifications enumerated above.

A. F. DICKERSON,
Manager, Lighting Division,
General Electric Company,
Schenectady, N. Y.

•

Utility Employees As Bond Buyers

To the Editor of ELECTRICAL WORLD:

If an editor wishes to confine his articles to statements with which his readers would be in unanimous agreement, his task is undoubtedly a most difficult one. Were he to comment on the generally accepted shape of the earth he would probably expect and receive some

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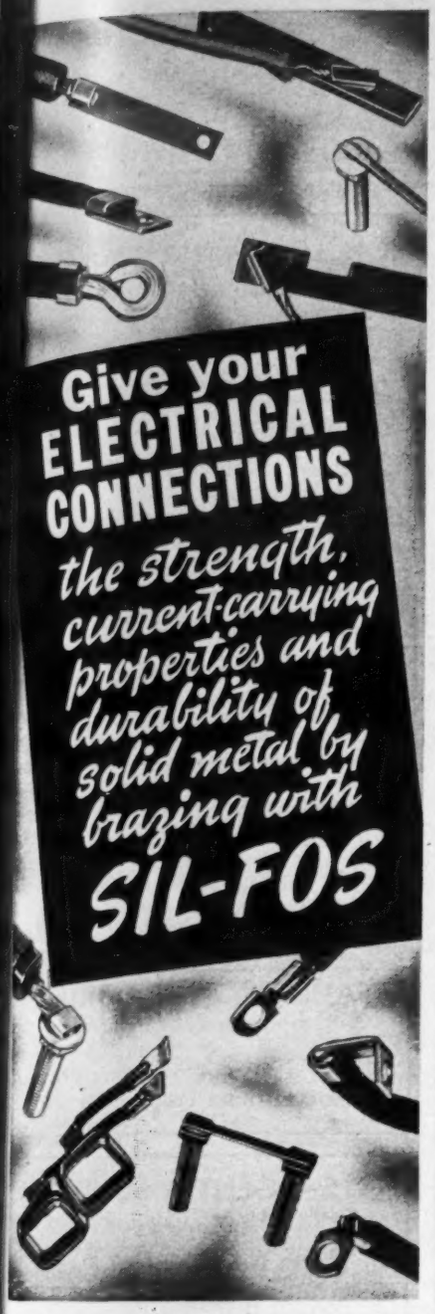

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pretty good arguments to the contrary. You will, therefore, not likely be surprised that a reader differs somewhat with your editorial "Utility Workers' Purchases of War Bonds."

That utility employees have not enjoyed an increase in wages comparable with those in many war plants is certainly correct in a great many instances. On the other hand, I believe that it should be recognized that the bloated overtime slip of the war worker is most frequently acquired by long hours on the job, encroaching upon his time, which his less fortunate friend may devote to rest, recreation, home and family, church, community activities, and even a Victory garden. It would appear that the modest yet steady wage, combined with job security and generally in a fixed location, may have encouraged habits of thrift among utility employees which should make those groups an outstanding potential source of war bond purchases. Even though the utility employee has a generous mortgage on his home, he is probably still comfortably established in it and has not been obliged to migrate to a war center where living conditions may be most difficult and expensive.

It is hardly likely that groups of utility employees have at any time failed to do their share for the community chest and other worth-while endeavors on the pretext that there simply wasn't enough available for the purpose after bare subsistence costs had been met. Will they say that now about the purchasing of war bonds? Their fellow workers, who have entered the armed services, did not demur on the ground that things had always been different with them; that they just didn't feel equal to the personal sacrifice and radical readjustments which were entailed. They have gone and are doing their best!

The evils of inflation are being well publicized. No one stands to suffer more than the utility employee and the sources from which his wages come, were inflation permitted to run its course. From a selfish standpoint, then, if no other, it would appear that the positive approach should be taken. Utility employees if properly stimulated can make the sacrifice, if it can be termed as such, to invest not 5 percent but in many cases 10 or 15 percent. Of course there will be extenuating circumstances where individuals cannot invest even 1 percent. These individuals have our most sympathetic consideration. However, those persons will not require a printed list of arguments to justify their failure to participate.

The persons who resist from selfish reasons are the ones who will use them. Is is not probable that the bond

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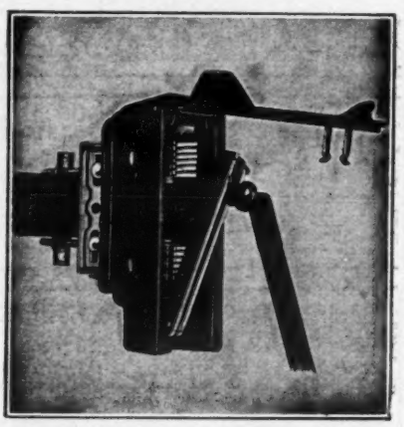

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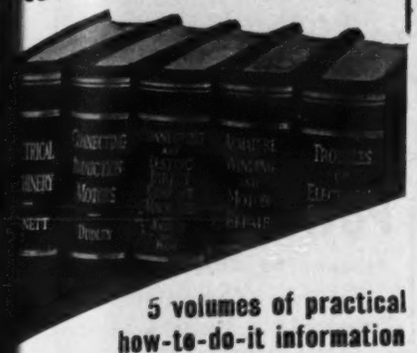

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The writer expresses the belief that an aggressive and confident attitude that it can be done is to be preferred over one that anticipates the reasons why it cannot be done. The public utility industry has not achieved the contributions which it has made to our country's progress through a defeatist attitude!

A UTILITY EMPLOYEE.

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Renew Request for Foster Creek Dam

The Columbia Basin Commission, at a recent meeting in Brewster, Wash., acted favorably upon a five-county citizens' delegate request for immediate completion of engineering on the Foster Creek dam site on the Columbia River.

U. S. Army Engineers' report in 1931 showed that power could be produced at $50 per horsepower at this dam site, compared with $70 per horsepower for Grand Coulee. George Zahn, spokesman for the Chelanx, Grant, Okanogan, Douglas and Ferry county group, declared that the Foster dam site will be required in the not distant future.

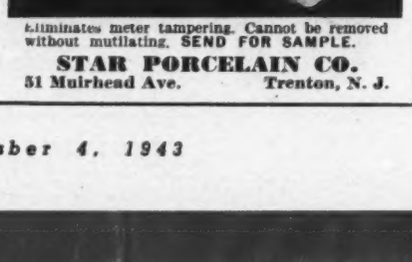
A dam 161 feet above water level is contemplated.

•

Will Open New Warehouse

Announcement has been made by the Electric Equipment Co., Rochester, N. Y., of the opening of a new warehouse at 63 Curlew Street on September 15.

STAR METER SEAL



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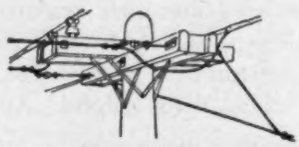

Shows how strain caused by right angle taps can be relieved

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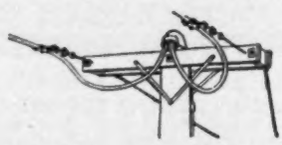

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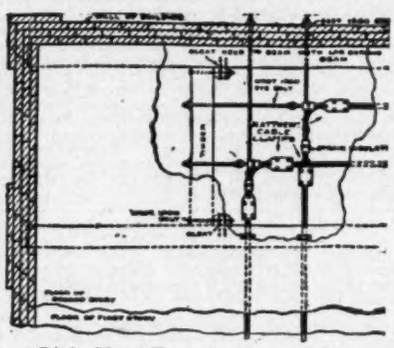

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1250	G.E.	MPC	550	130
800	G.E.	MPC	660	600
625	G.E.	MPC	600	130
600	G.E.	MPC	600	650/900
600	Whse.		260	150/275
350	G.E.	MPC	230	450
300	G.E.	DMC	230	400/600
300	Cr.Wh.	CMC	230	1150
300	G.E.	MPC	230	275/550
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250	Whse.		230	400
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100	Whse.	1	OISC	13200x25

GEAR UNITS

2—2100 HP Whse., 1800/375 RPM.
1— 943 HP GE 5306/1200 RPM.
1— 720 HP DeLaval 3600/600 RPM.

MOTOR GENERATOR SETS

3 ph. 60 cycle

1—1500 KW GE 600 600 V. DC, Gen. dc. to 2100 HP—6000 V. Syn. Motor with exciter.
1—1000 KW G.E. 250 V. DC Gen. dc to 1400 HP—2200/132000 V. Syn Motor.
1—500 KW GE 600 V. DC Gen. d.c. to 700 HP—2200/13200 V. Syn. Motor with Exciter.
2—250 KW GE 250 V. Gen. d.c. to 375 HP—2200 V. Syn. Motor.

TURBO GENERATOR SET

1—500 KW, Whse. 625 Kva., 440 V., 3 ph., 60 cy., 3600 RPM with Parsons 145/175 lb. condensing turbine complete with jet condenser and accessories.
1—500 KW, G.E., 625 KVA, 2300 V., 3 ph., 60 cy. generator with Curtis 4 stage, 150 pound condensing turbine complete with condenser, etc.

ROTARY CONVERTERS

60 cycle

2—1500 KW, Whse. 720 RPM 650 V. DC with 3-single phase, 33000 V. transformers and panel.
1—1250 KW, G.E., 720 RPM 250 V. DC with 1375 KVA, 3 ph., 2300 V. Transformers and Panels.
2—750 KW, Whse. 1200 RPM, 600 V. DC with 2300/6600/11000 volts Transformers and Panels.
1—750 KW, Whse. 720 RPM 250 V. DC with three phase 6600/2300 V. Transformer and Panels.
1—375 KW, Whse. 1200 RPM 250/275 V. DC with 2200/6600 V. Transformer and Panels.
1—300 KW, G.E., type HCC, 1200 RPM, DC, 600 V. AC 6 ph., 1200 RPM.

25 cycle

3—1500 KW, G.E. 225/275 V. DC Booster type each with 1600 KVA, 3 ph. 6765 volt Transformers and Panels.
1—500 KW, G.E., 225/275 DC Booster type with 500 KVA 3 ph. 6765 volt Transformer and Panels.

A. C. MOTORS

3 ph. 60 cycle

Synchronous

	HP	Make	Type	Volts	Speed
1—	500	G.E.	TS	440	360
1—	250	G.E.	ATI	220	450
1—	225	G.E.	ATI	240	600
1—	200	Whse.		440	514
1—	168	Al. Ch.		2300	900
1—	159	Whse.	G	2400	900
1—	150	Whse.	G	2300	900
1—	150	Whse.		2200/550	1800

Slip Ring

1—	1200	Cr-Wh.	801-Q	2200	237
1—	800	Whse.	CW	440	357
1—	800	Al. Ch.		440	585
1—	600	G.E.	IM	2200	900
1—	450	Whse.	CW	2200	875
1—	400	G.E.	MT	550/440	300
1—	400	Al. Ch.		2300	505
1—	400	Al. Ch.		440	1200
1—	350	G.E.	IM	2300/4000	257
1—	300	G.E.	IM	2300	585
1—	250	G.E.	MT-410	2300	400
1—	250	G.E.	MT	4000/2300	257

Squirrel Cage

1—	500	G.E.	1-17B	2200	695
1—	400	Whse.	CS-1104A	2200	585
1—	300	Whse.	CS	550	580
2—	300	G.E.	IK	2300	600
1—	250	Al. Ch.		220/440	1150

SINE WAVE SET

Main unit—GE 3 unit, 4 Brg. consisting of motor—15/35 HP. 750/1800 RPM 230 V. DC Gen.—15 KW—220/110 V., 1800 RPM—3 ph., 60 cy.
Ref. Gen.—5 KW—36/18 V., 1800 RPM, 3 ph., 60 cy., with stator shifting.
Complete with Exciter Set. Voltage regulator, panels and accessories.

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MOTOR—3 PHASE 60 CYCLE

1—5000 ampere, 6 volt, Hanson-Van Winkle
1—2000 ampere, 6 volt, Hanson-Van Winkle
1—1500 ampere, 6 volt, Hanson-Van Winkle
1—500 HP, 900 RPM, 440 volt, Lincoln slip ring
1—400 HP, 514 RPM, 440 volt, Westg., slip ring
1—325 HP, 600 RPM, 2300 volt, G E. syn.
1—500 HP, 900 RPM, 440 volt, Lincoln slip ring.
1—250 HP, 514 RPM, 4000 volt, G.E., syn.
1—250 HP, 600 RPM, 4000 volt, G.E., sync.
1—200 HP, 600 RPM, 2200 volt, G.E., sl. rg.
1—200 HP, 450 RPM, 2200/4000 v. G.E., sl. rg.
1—150 HP, 1800 RPM, 440 volts, G.E., sq. cg.
1—150 HP, 900 RPM, 440 volt, Al. Ch. sl. rg.
2— 75 HP, 1200 RPM, 2300 volt, G.E., vertical.

MOTORS—D. C. 230 VOLTS

2—450 HP, 400 RPM, General Electric MPL.
1—250 HP, 760 RPM, Electro Dynamic.
2—150 HP, 550 RPM, Westinghouse, SK.
1—150 HP, 750 RPM, Electro Dynamic.
4—125 HP, 600 RPM, Westinghouse, SK.
1—100 HP, G.E., 575 RPM.
1—100 HP, 625 RPM, G.E.
1— 65 HP, 1000 RPM, G.E., type RC.
1— 50 HP, RPM, Westinghouse, type SK.

TRANSFORMERS

2—400 KVA, G.E., 4156-240/480 v Scott taps.
3—300 KVA, Pittsburgh, 7800/440 volts.
3—250 KVA, General Electric 6600/2200/220/440.
3—200 KVA, General Electric 2200/220/440.
3—200 KVA, G.E., 2200-220/440 volts.
3—150 KVA G.E., 33,000 2300/4000 Y.
3—100 KVA, Westinghouse, 11,430/250 volts.
3—100 KVA, G.E., 2200-220/110 volts.
1—100 KVA, Pittsburgh, 1375/2750-110/220 volts.
3—100 KVA, Westinghouse, 13200 250 volts.
3—75 KVA, General Electric 2200/220/440.

MOTORS GENERATOR SETS

1—750 KW, 250 volt, Allis Chalmers, synchronous.
1— 75 KW, 125 volt, Crocker Wheeler, synchronous.
1— 35 KW, 125 volt, Elec. Machinery, sq. cage.

MOTORS—VARIABLE SPEED 230 VOLTS

1—750 KW, 250 volt Allis-Chalmers synchronous.
1—150 HP, 350/1050 RPM, Crocker-Wheeler.
1—90 HP, 470/940 RPM, General Electric.
1—75 HP, 525/1575 RPM, Electric Dynamic.
1—35 HP, 500/15000 RPM, Westinghouse.
1—35 HP, 350/1050 RPM, Electric Dynamic.
1—30 HP, 225/900 RPM, Crocker-Wheeler.
2—25 HP, 300/900 RPM, Electro Dynamic.
1—20 HP, 750/1500 RPM, General Electric.
1—13/18 HP, 350/1200 RPM, Electro Dynamic.
1—5 HP, 600/1200 RPM, General Electric.
1—5 HP, 450/1800 RPM, Crocker-Wheeler.

ALTERNATORS

1—625 KVA, 3600 RPM, 600 volt, G.E.
1—250 KVA, 720 RPM, 230 volt, G.E.
1—225 KVA, 514 RPM, 600 volt, Westinghouse.
1—200 KVA, 3600 RPM, 240 volt, Allis Chal.
1—62½ KVA, 3600 RPM, 220 volt, Allis Chalmers.

TURBO-GENERATORS

600 KW, Terry dual bleeder condensing Turbine only.
1—500 KW, G.E., 3 ph., 60 cy., 480 volt, bleeder
1—375 KVA, Westinghouse, non-condensing.
1—300 KW, G.E., 3 ph., 60 cy., 220 volt, cond.
1—200 KW, G.E., 3 ph., 60 cy., 220 volt, cond.

ENGINE GENERATOR SETS

1—150 KVA. General Electric Generator, Ames Uniflow engine.
1—62½ KVA. Westinghouse Generator, Fairbanks company engine.

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300 RPM, 1570 amperes, serial 4,900,000,
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1400 HP 460 volts, 3 phase, 60 cycle,
300 RPM General Electric, 1570 ampere
1250 KVA p.f. 0.9, 50-deg. type ATI-24-1250M-300 form C, with amortisseur winding.

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